

The Milbank Memorial Fund
QUARTERLY

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IN THIS ISSUE

MORTALITY among young men aged 20-34 has declined nearly 30 per cent since the World War. However, results of Selective Service examinations do not indicate a similar improvement in the physical status of living young men. These significant facts are discussed in the article "Physical Status of Young Men, 1918 and 1941," by Mr. George St. J. Perrott. Because the health status of the civilian population is of grave concern to us in our program of national defense, the leading causes of rejection of young men called for military training should be seriously studied. Mr. Perrott points out that they may serve as a guide in the planning of future health services to the end that future generations of young men may have the maximum possible health and vigor.

Defective teeth is the leading cause of rejection among young men called for military training. Eight per cent of the total men examined have been excluded for this reason. Since present knowledge is not sufficient for the prevention of initiation of caries, prevention of serious dental defects is dependent upon procedures of dentistry. In the article, "Dental Status and Dental Needs of Young Adult Males," Dr. Henry Klein discusses not only the present needs but also points out how the prevention of dental rejectability may be obtained by means of a program of systematic dental servicing.

In "The Regional Approach to the Study of High Fertility," Dr. Rupert B. Vance draws upon material from a larger investigation, *The Southern People*, a project at the Institute for Research in Social Science at the University of North Carolina. The dual purpose of the paper is to

present available data concerning the extent and causes of high fertility in the Southeast, and to offer a methodological framework for such studies. In the first part of the paper, the author utilizes available official data for a factual description of the problem and for ascertaining the extent to which factors of a demographic nature are responsible for the excess fertility of the area. He finds that less than half of the excess fertility in the Southeast can be accounted for by differences in racial, rural-urban, and age composition. In the second part, Dr. Vance emphasizes the need for supplementing statistical data with studies of the culture complex of high fertility areas, of the values and attitudes of the group. His description of the Southeast from this standpoint is designed to be suggestive rather than conclusive, but it provides specific recommendations which should be of value in studies of the cultural and psychological factors affecting human fertility.

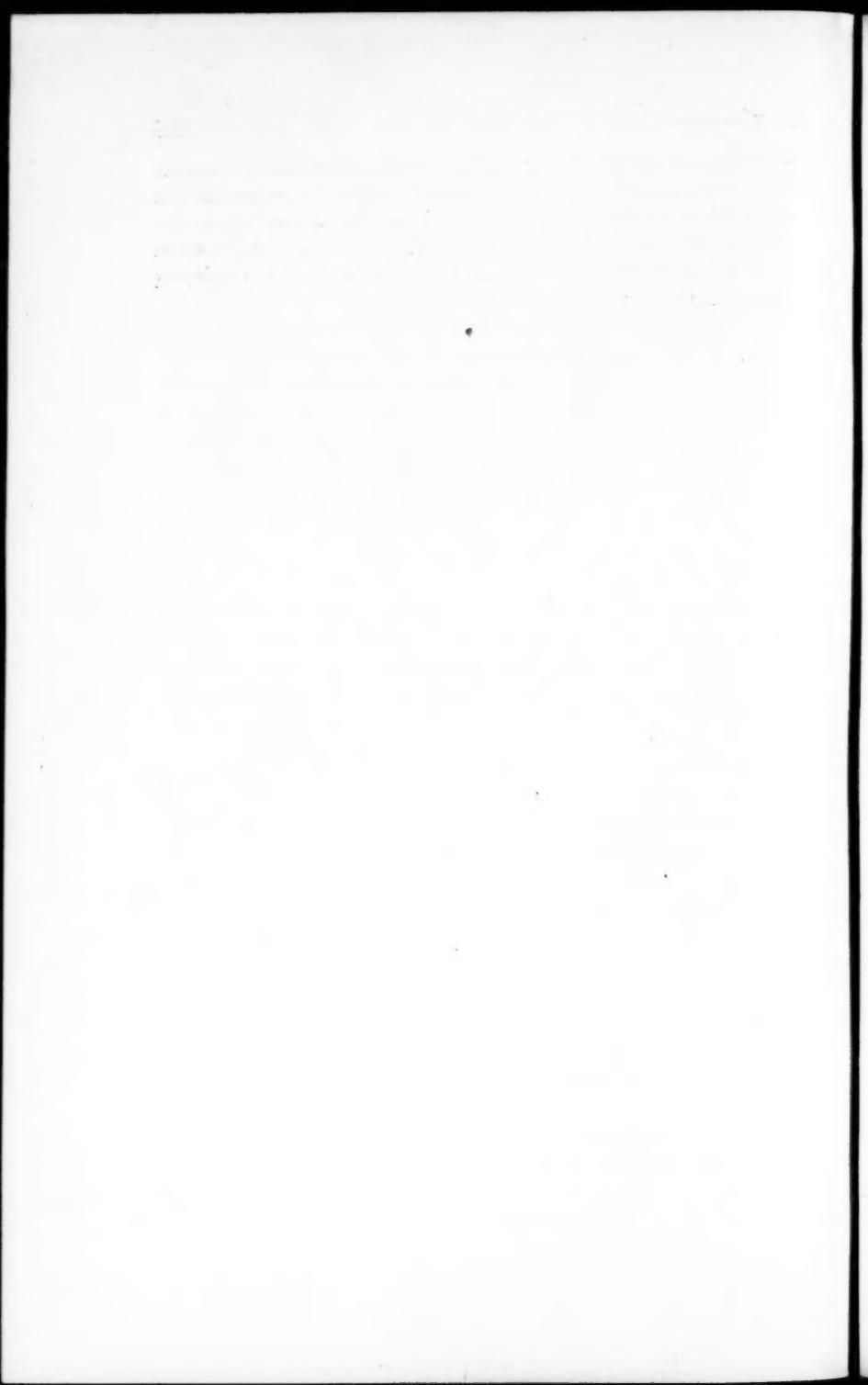
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Trends in morbidity rates are rarely available, even for short periods of time or for small population groups. For a child population, changes in the frequency of illnesses causing school absence during the past twenty years are discussed by Antonio Ciocco, W. R. Cameron, and Elizabeth Bell in the article entitled: "A Comparison of the Morbidity of Hagerstown, Maryland, School Children in 1921-1925, 1935-1936, and 1939-1940." In the later periods absenteeism was higher for both boys and girls of different ages than in the earliest period. Since the increase was found chiefly in absences caused by minor disorders and ailments, the authors suggest that the actual incidence of these illnesses may not have been higher but that parents are now more likely to keep a child at home for such complaints. Careful study of these data will repay public health workers who are concerned with the prevention and reduction of illness.

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Case-finding in tuberculosis is a costly procedure, but when measured against the estimated monetary losses caused by the disease, the expenditure for the discovery of cases seems relatively small. Even so, methods of case-finding should be constantly tested for their efficiency; one important criterion of their relative value is the cost of each. Dr. H. R. Edwards, E. Rocks, and A. V. Biorklund present a method of cost account-

ing in the article, "The Economics of Mass Examination for Tuberculosis." They stress the need for comparable methods of analysis of cost of procedures in the control of tuberculosis. The authors express the hope that this report will stimulate administrators to make detailed cost studies of the various methods of case-finding which they are employing so that others may profit by their experience.



PHYSICAL STATUS OF YOUNG MEN, 1918 AND 1941¹

GEORGE ST. J. PERROTT

WHILE death rates among young men aged 20-34 years have declined nearly 30 per cent since the World War (Figure 1 shows comparisons for selected causes), results of Selective Service examinations do not indicate a similar improvement in the physical status of living young men. About 43 per cent of all men examined for military service are being declared unfit for general military service (as of March, 1941) either by local draft boards or at army induction centers. This compares with a figure of about 30 per cent rejections in 1917-1918.

Of the 43 per cent of men declared unfit for general military service, 32 per cent are so classified by the 6,450 local boards and an additional 11 per cent at the army induction centers. This means that out of every hundred men declared physically fit by the local boards, an average of sixteen are rejected later in the thorough reexamination at the army induction centers.

While draft board and army physicians rejected 43 per cent of men for full military service, only 28 per cent were considered unfit for any service (Figure 2). The remaining 15 per cent were classed as fit for limited service, and many of these undoubtedly had defects which were remediable.

The local board figures represent an estimate based on a review of a large proportion of the examination records received by the National Headquarters of the Selective Service System, and cover the period from the beginning of examinations under the Act to about the end of March. The induction center data are based on complete figures for the period up to February 1 (18,971 men returned to local boards out of 120,689 men examined at induction centers).

¹ Presented at the Nineteenth Annual Meeting of the Milbank Memorial Fund. Published by permission of the Surgeon General, United States Public Health Service.

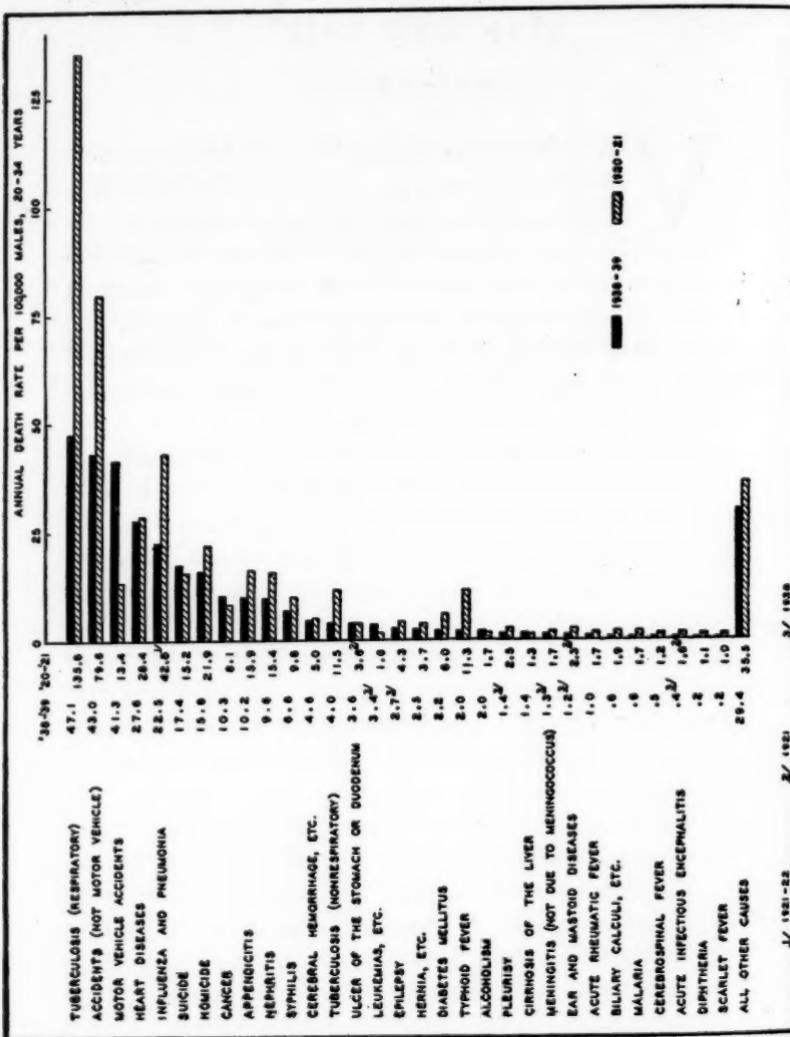


Fig. 1. Mortality from selected causes among males, 20-34 years, 1938-1939 and 1920-1921, for Registration States of 1920.

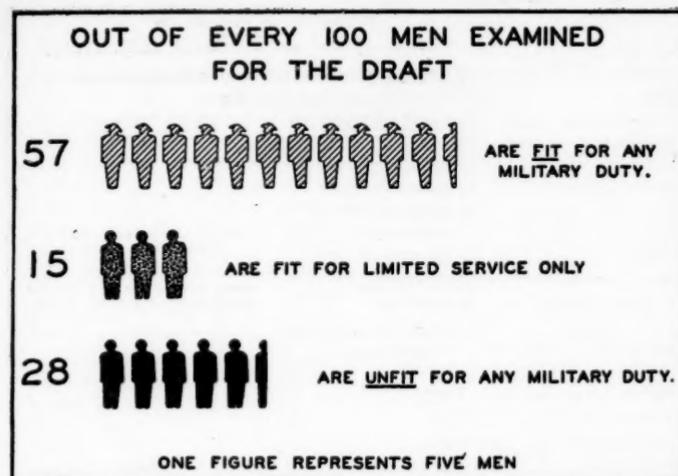


Fig. 2. Classification of men examined at Selective Service local boards through March, 1941, and army induction centers through January, 1941.

In interpreting these findings, the question of age is of importance. The Selective Service ages are 21 to 35. However, the effect of deferments for other than physical reasons is to concentrate the group examined in the ages 21 to 25, the period when physical health should be at its best.

Of interest is the relative importance of various causes of disqualification today and during the World War, as shown in Figure 3. The data for the World War draft are based on local board and "second million" examinations.⁸ The causes have been classified according to the diagnosis groups being used for preliminary studies of examinations under the Selective Service Act of 1940. Since the World War data included a second impairment, if present, an arbitrary correction was necessary to make comparisons possible.⁹

⁸ Perrott, George St. J. and Britten, Rollo H.: Summary of Physical Findings on Men Drafted in the World War. *Public Health Reports*, January 10, 1941, 56, No. 2, pp. 41-62, Reprint No. 2223.

⁹ The duplication was eliminated by multiplying by a factor obtained by dividing the
(Continued on page 340)

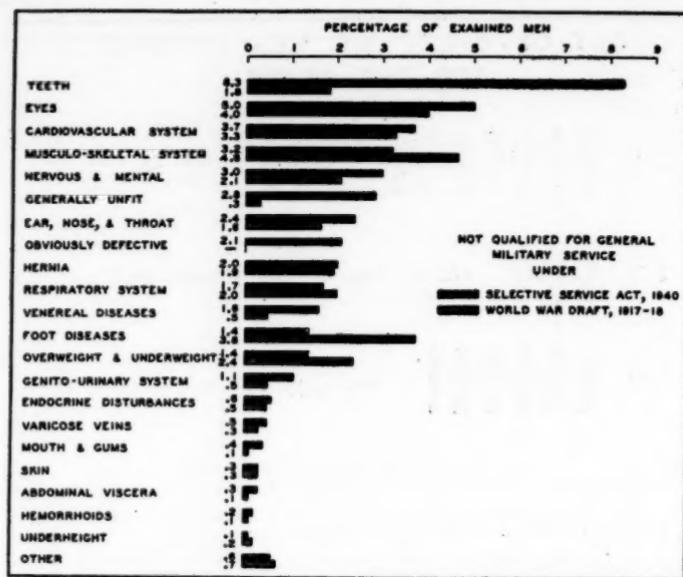


Fig. 3. Proportion of men classed as not qualified for general military service for specified causes in 1940 and in 1917-1918.

The most striking difference between the results of 1917-1918 and today is the present high percentage of rejections because of defective teeth, which are over four times as high as in the World War draft. It should not be concluded that this necessarily indicates an increase in the prevalence of dental disease since 1918. It may indicate that young men today have had less dental care during childhood and adolescence than those of 1918, due perhaps to the effect of the depression. Furthermore, while army standards have not changed since the last war, it is possible that they are being more rigidly enforced today. Other factors may play a part, such as the fact that deferments because of dependents or essential occupation tend to concentrate young men of low economic status who have had inadequate

percentage of men classified as not qualified for general military service by the rate of defects per 100 persons recorded among such men. These percentages were, respectively, 31.2 and 41.4, giving a factor of 0.7536.

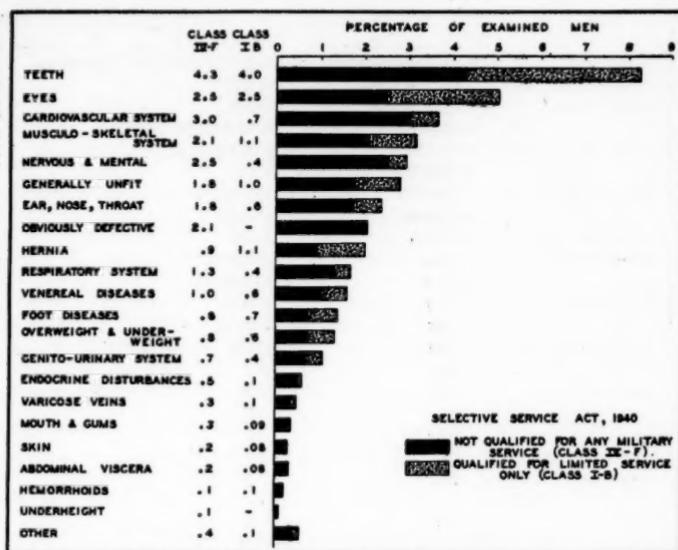


Fig. 4. Proportion of men classed as IV-F and as I-B for specified causes under Selective Service Act, 1940, by Selective Service local boards and army induction centers.

quate dental care in the group who are certified for physical examinations.

Rejections for respiratory disease (largely tuberculosis) are only a little lower than in the World War (1.7 per cent as compared with 2.0 per cent). Since mortality from tuberculosis has been cut in half in that time, it would appear that a better case-finding job is being done in the present examinations.

Rejections for venereal disease constitute 1.6 per cent of men in the present examinations as compared with 0.5 per cent in the last draft. This higher percentage need not indicate an increase in the prevalence of venereal disease since 1918 but is probably due to more rigid standards today, which exclude men with venereal disease, and to the use of better diagnostic methods.

In Figure 4, the percentage rejections for various causes in 1940

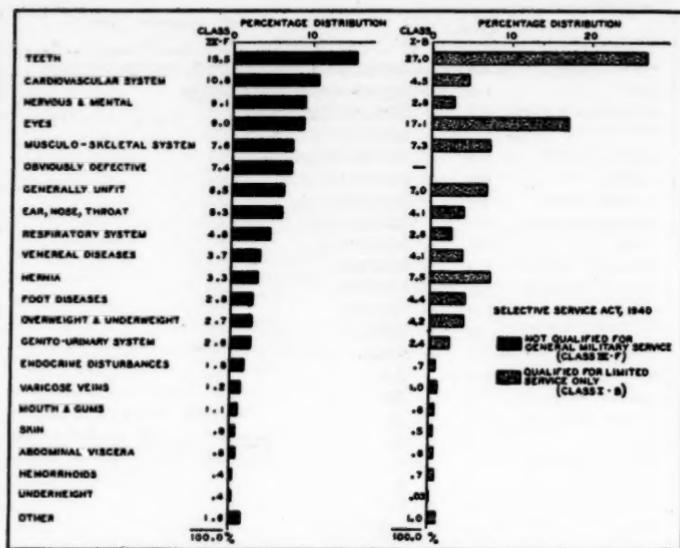


Fig. 5. Proportion of men in Class IV-F and in Class I-B rejected for specified causes by local boards and induction centers.

have been divided into two parts—the percentage classified as not qualified for any military service for a particular cause (Class IV-F) and the percentage classed as qualified for limited service only (Class I-B). It will be seen that about equal proportions were put in each class for such causes as defective teeth, eyes, hernia, and foot diseases while such defects as nervous and mental disorders, cardiovascular defects, and respiratory diseases (largely tuberculosis) were considered more serious by the medical examiners and placed largely in Class IV-F.

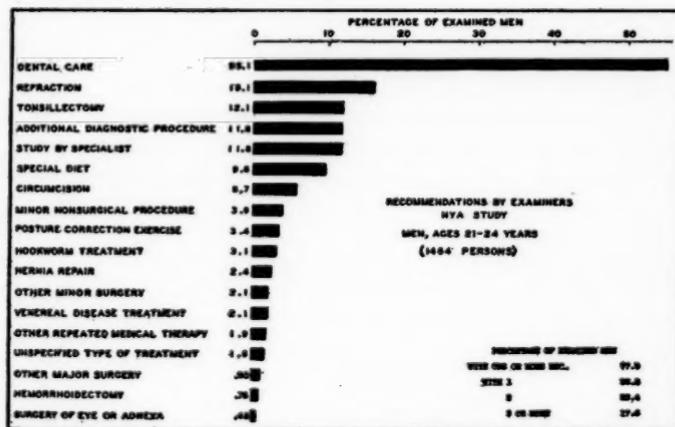
Figure 5 shows the data expressed in a different way, with the defect rate in each class considered as 100 per cent. This indicates that in the limited service group, supposedly comprising a large proportion of young men with remediable defects, over 50 per cent of the men were so classed because of three types of defects—teeth

(27.0 per cent), vision (17.1 per cent), and hernia (7.5 per cent).

In spite of the higher percentage of rejections reported today than in 1917-1918, it can not be said that the physical status of young men has deteriorated since the World War. Neither can it be said that the health of young men has improved. Differences in physical examination standards, in technique of examining physicians, and other factors make comparison difficult until the data can be analyzed in more detail. Rejections for defective teeth are obviously higher than in 1918; otherwise, the important causes of rejection today are the same as those in the World War draft.

Recent preliminary results of physical examinations in National Youth Administration projects confirm the results of Selective Service. Nearly 30 per cent of N. Y. A. male youths aged 21-24 were judged by examining physicians to have physical defects which handicapped them to a greater or less extent for work. To remedy these conditions, physicians recommended eye refractions (16 per cent of the youths examined), tonsillectomy (12 per cent), special diet (9.6 per cent), hernia repair (2.4 per cent), venereal disease

Fig. 6. Recommendations of medical examiners in National Youth Administration program, 1941, men, ages 21-24 years.



treatment (2.1 per cent), hookworm treatment (3.1 per cent), and other medical or surgical procedures in a large number of cases (Figure 6).

The correction of defects among our young men must be regarded as of importance not only from the point of view of military man power, but also from that of industrial man power and public health generally. Furthermore, while these figures point to the need for remedial care, they emphasize also the fact that many of the impairments could have been prevented by more extended public health programs during the period of growth of these individuals. The statistics of the last draft have provided material for papers by medical statisticians for over twenty years. It is to be hoped that the implications of the present figures will be apparent to others than statisticians and will promote the planning of future health services for children and adolescents to the end that future generations of young men may have the maximum possible health and vigor.

THE DENTAL STATUS AND DENTAL NEEDS OF YOUNG ADULT MALES^{1,2}

HENRY KLEIN

DURING the winter and spring of 1940-1941 dental examinations were made of approximately 1,400 men. A major proportion of these individuals were enrolled in National Youth Administration projects located in Maryland and West Virginia, and the remainder were attending a National Defense Training School in Hagerstown, Maryland. Among the 1,400 men examined there were included a total of 642 whose ages covered the range 21 to and including 35 years.

The dental examination records of each of these 642 men were reviewed with the purpose of finding those men who would and those who would not meet the dental requirements set down by Selective Service for admittance to full military duty. These requirements are given in the United States War Department Mobilization Regulations MR 1-9, issued August 31, 1940, as follows:

Paragraph 31. Classes 1-A and 1-B

a. Class 1-A

(1) Normal teeth and gums.

(2) A minimum of 3 serviceable natural masticating teeth above and 3 below opposing and 3 serviceable natural incisors above and 3 below opposing. (Therefore, the minimum requirements consist of a total of 6 masticating teeth and of 6 incisor teeth.) All of these teeth must be so opposed as to serve the purpose of incision and mastication.

(3) Definitions

(a) The term "masticating teeth" includes molar and bicuspid teeth, and the term "incisors" includes incisor and cuspid teeth.

(b) A natural tooth which is carious (one with a cavity) which

¹ From the Division of Public Health Methods, National Institute of Health, United States Public Health Service.

² Presented at the Nineteenth Annual Meeting of the Milbank Memorial Fund. This paper was published, in more detail, in *Public Health Reports*, July 4, 1941, 56, No. 27, pp. 1369-1387.

can be restored by filling, is to be considered as a serviceable natural tooth.

(c) Teeth which have been restored by crowns or dummies attached to bridgework, if well placed, will be considered as serviceable natural teeth when the history and the appearance of these teeth are such as clearly to warrant such assumption.

(d) A tooth is not to be considered a serviceable natural tooth when it is involved with excessively deep pyorrhea pockets, or when its root end is involved with a known infection that has or has not an evacuating sinus discharging through the mucous membrane or skin.

b. *Class 1-B*

Insufficient teeth to qualify for class 1-A, if corrected by suitable dentures.

Paragraph 32. Class 4

a. Irremediable disease of the gums of such severity as to interfere seriously with useful vocation in civil life.

b. Serious disease of the jaw which is not easily remediable and which is likely to incapacitate the registrant for satisfactory performance of general or limited military service.

c. Extensive focal infection with multiple periapical abscess, the correction of which would require protracted hospitalization and incapacity.

d. Extensive irremediable caries.

For the purposes of the present report, the men who would meet the requirements for Class 1-A are designated "acceptable" and those who would not are designated "rejectable."

A total of 97, or 15.1 per cent,¹ of the 642 men fell into the rejectable group,² the remaining 545 men having a dental status which

¹ The percentage of rejections obtained here is somewhat higher than that observed from actual selective service findings. The higher percentage found in the West Virginia and Maryland men is probably, in part, a resultant of a difference in age distribution. The actual selectees are probably somewhat younger than the men examined for the present study. Other factors probably also contribute to the high percentage of rejectables for dental conditions. Among these may be mentioned the socio-economic status of the men examined and the possibility that some of them might be counted by Selective Service as rejectable for other than dental defects.

² The rejectables include some men who have insufficient teeth to qualify for Class 1-A and who do not have their insufficient teeth "corrected by suitable dentures" (thus they do not qualify for Class 1-B) and who obviously do not have enough irremediable dental disease to place them in Class 4.

GROUPS EXAMINED	CHRONOLOGICAL AGE (LAST BIRTHDAY) IN YEARS															
	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	All Ages
NUMBER EXAMINED																
BOTH GROUPS	145	121	107	75	31	21	28	10	29	13	11	18	13	10	10	642
Rejectables	10	12	14	6	5	3	4	3	10	4	5	8	4	4	5	97
Acceptables	135	109	93	69	26	18	24	7	19	9	6	10	9	6	5	545
PER CENT REJECTABLE																
	6.9	9.9	13.1	8.0	16.1	14.3	14.3	30.0	34.5	30.8	45.5	44.4	30.8	40.0	50.0	15.1

Table 1. The number of men examined and the number found rejectable or acceptable and the per cent found rejectable. Data arranged by the single chronological ages and derived from examination of 642 men of West Virginia and Maryland.

would justify their being designated acceptable (dentally) for military duty in Class 1-A. The numbers of men examined and their ages and the number found rejectable or acceptable are given in Table 1.

FINDINGS

Description of dental status is accomplished through measurement of: (a) the tendency to be attacked by caries (the number of decayed, missing, and filled teeth or tooth surfaces per man); (b) the volume of dental service received (the number of filled teeth or tooth surfaces per man); and (c) the residuum of experience with caries which has not received treatment by fillings (the number of unfilled carious teeth, the number of teeth indicated for extraction, the number of teeth extracted). Dental needs (due to caries) are measured in terms of the three ingredients of the unfilled residuum of caries experience, namely: (a) the tooth surfaces carious and requiring fillings; (b) the teeth carious and indicated for extraction; and (c) the teeth already extracted presumably because of caries involvement. These two latter ingredients (b and c) together represent the need for prosthetic replacements.

Measurement of the tendency to experience caries is based on the fact that the stigmata of caries attack are essentially non-erasable. For example, a permanent tooth attacked by caries in a person 7 years of age will appear at a later chronological age as a carious tooth which should be filled, as a tooth which has been filled, as a tooth so extensively carious as to require extraction, or as a tooth already extracted. Teeth which fall into any of these four categories of caries experience are designated "DMF teeth" (decayed, missing, and filled). The summation of the numbers of permanent teeth representing these categories of caries experience, expressed on a per man basis, provides a broad measure of the tendency of a group to experience caries attack. A more detailed description of caries tendency is obtained by summation of the number of permanent tooth surfaces which fall into the several categories of caries experience. Such surfaces are termed "DMF surfaces." In these summations a tooth both carious and filled is counted as one DMF tooth

Table 2. Dental status of the permanent teeth of rejectables (R) and acceptables (A). Data for the specified components of dental status are expressed per man of specified chronological age group. Data derived from examination of 642 men of West Virginia and Maryland.

COMPONENTS OF DENTAL STATUS	GROUP	CHRONOLOGICAL AGE IN YEARS (LAST BIRTHDAY)															All Ages
		21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	
Teeth																	
Carious— Requiring Fillings	R	4.9	5.4	6.9	7.0	5.2	4.0	5.3	4.7	5.3	5.3	5.2	7.0	3.0	3.5	2.4	5.4
	A	5.5	5.3	5.6	5.5	5.4	6.6	6.0	4.6	5.6	5.6	3.8	5.8	7.0	3.2	7.2	5.5
Extracted	R	10.1	9.4	10.6	11.3	14.0	10.0	11.5	12.7	14.2	15.3	22.8	11.4	14.5	20.3	20.8	13.0
	A	2.1	1.9	2.6	2.0	3.8	3.9	3.1	3.9	4.0	5.7	4.5	5.4	3.2	2.7	6.6	2.6
Carious— Indicated for Extraction	R	3.4	3.9	2.6	3.0	1.0	6.3	1.8	3.0	1.2	4.8	0	1.6	0.5	1.5	0.6	2.4
	A	0.7	0.5	0.6	0.3	0.8	1.3	1.5	0.7	1.5	0.8	0.7	1.4	1.6	0.8	1.0	0.7
Filled	R	1.0	2.2	2.6	3.5	1.0	0	1.3	2.7	3.0	1.5	1.8	2.6	2.0	1.0	2.0	2.1
	A	1.8	1.9	2.3	3.3	3.0	2.3	2.8	2.4	3.5	5.2	5.5	2.8	1.2	4.5	2.6	2.4
DMF	R	19.2	20.7	22.0	24.5	21.2	20.3	19.8	22.0	23.2	26.5	29.4	22.8	19.3	25.5	25.6	22.5
	A	9.8	9.4	10.9	10.8	12.8	13.7	13.4	11.0	14.3	16.4	13.8	15.3	12.9	10.8	17.2	11.0

and a surface both carious and filled is counted as one DMF surface. An extracted tooth is arbitrarily counted as five DMF surfaces.

Information on the dental status and major dental needs of the two groups of men is given in Tables 2 and 3.

Per rejectable man (ages 21-35 years) more than twenty-two permanent teeth have been attacked by caries (DMF). Per man of this group, 2.1 teeth have been filled, 2.4 teeth are carious to such an extent as to require extraction, 5.4 teeth require one or more surfaces filled, 7.6 tooth surfaces need to be filled, and the thirteen teeth already extracted plus the approximately two teeth needing extraction constitute the need for prosthetic replacement. Thus per rejectable man more than two-thirds of the dentition has been attacked by caries, close to one-half has been lost, only one-sixteenth shows treatment by fillings, and more than one-sixth is affected by unfilled caries which is in such condition as to justify treatment by fillings.

Per acceptable man (ages 21-35 years) eleven permanent teeth

Table 3. Dental status of the permanent tooth surfaces of rejectables (R) and acceptables (A). Rates for the specified components of dental status are expressed per man of specified chronological age group. Data derived from examination of 642 men of West Virginia and Maryland.

COMPONENTS OF DENTAL STATUS	GROUP	CHRONOLOGICAL AGE IN YEARS (LAST BIRTHDAY)															All Ages
		21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	
Surfaces																	
Carious— Requiring Fillings	R	6.6	7.7	9.7	10.2	5.8	5.0	8.0	5.0	7.7	7.8	9.4	11.3	4.3	3.5	3.6	7.6
	A	7.2	6.7	7.1	7.1	7.0	8.1	7.4	6.3	6.7	7.0	4.2	8.4	8.9	4.2	8.8	7.1
Extracted	R	50.5	47.1	52.9	56.7	70.0	50.0	57.5	63.3	71.0	76.3	114.0	56.9	72.5	101.3	104.0	65.2
	A	10.3	9.4	13.1	10.1	18.0	19.4	15.4	19.3	20.0	28.3	22.5	27.0	16.1	13.3	33.0	13.1
Carious— Indicated For Extraction	R	14.6	15.8	11.9	13.0	4.4	31.7	8.8	10.0	4.5	17.3	0	5.8	1.8	4.8	2.4	9.9
	A	2.9	2.4	2.7	1.3	3.2	4.6	6.0	3.1	6.3	2.9	2.2	5.8	7.1	3.3	5.0	3.0
Filled	R	1.5	2.6	3.0	6.3	1.6	0	4.5	3.3	5.0	2.5	2.4	4.5	3.0	2.3	2.2	3.1
	A	2.9	2.8	3.5	5.8	4.9	3.4	4.9	3.3	6.1	10.2	8.8	5.0	1.8	9.3	3.8	4.0
DMF	R	73.2	73.0	77.4	86.2	81.8	86.7	78.8	80.7	88.0	103.8	125.8	78.1	80.8	111.5	112.0	85.7
	A	23.2	21.2	26.3	24.1	33.9	35.3	33.6	31.6	39.0	48.1	37.3	46.2	33.7	30.0	50.6	27.0

have been attacked by caries (DMF). Per man of this second group, 2.4 teeth have been filled, 0.7 of a tooth is carious to such an extent as to require extraction, 5.5 teeth require one or more surfaces filled, 7.1 tooth surfaces need to be filled, and the 2.6 teeth already extracted plus the 0.7 of a tooth needing extraction constitute the need for prosthetic replacement. Thus, per acceptable man, approximately one-third of the dentition has been attacked by caries, only about one-tenth has been lost, approximately one-sixteenth shows treatment by fillings and more than one-sixth of the dentition is affected by unfilled caries of such limited character as to justify treatment by fillings.

COMMENT

It is clear, as shown by the data given in the tables and in Figure 1, that the rejectable men have a more pronounced tendency to be attacked by caries than the acceptables. It may be noted that the rejectables have more missing teeth (extractions and indicated extractions) than the acceptables have teeth showing evidence of caries experience (DMF). Rejectables, as determined by Selective Service requirements, therefore tend to be those men who fall in the upper end of the range of caries susceptibility. On the other hand, the acceptables, although they tend to distribute along a lower range of susceptibility, have a considerable caries tendency. It is clear that the acceptables have a caries susceptibility sufficient to render their current volume of carious surfaces needing fillings approximately equal in magnitude to that shown by the rejectables.

The present situation, that is, the existing profound loss of teeth in the rejectables and the large volume of reparative services in the form of fillings and prosthetic appliances currently needed by both the rejectables and acceptables, arises in the main from a long continued accumulation and neglect of carious teeth and tooth surfaces which have developed and remained untreated year after year since the men were about 6 years of age. It is clear that a large disparity has long existed and still exists between the rate of development of

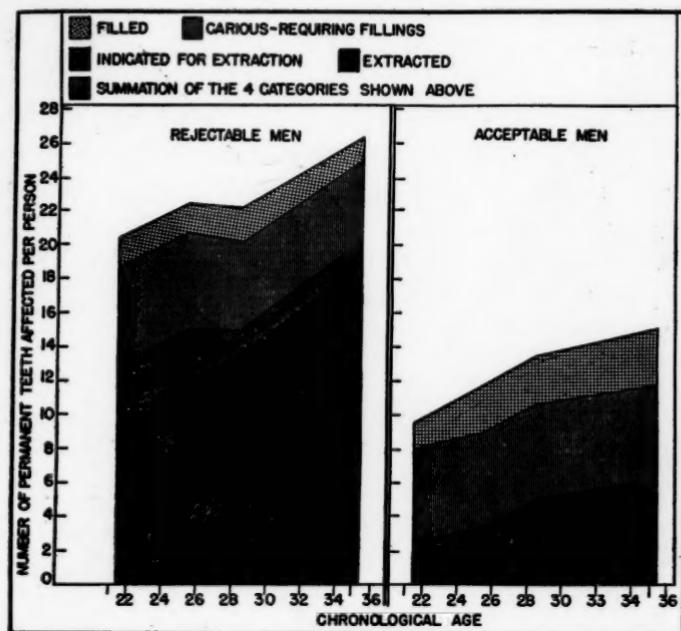


Fig. 1. Chronological age and the number of permanent teeth affected by the several categories of caries experience, per rejectable and per acceptable man. Data derived from examination of approximately 640 men aged 21-35 years in Maryland and West Virginia.

carious lesions and the rate at which these lesions are serviced by fillings in both the acceptables and the rejectables. The material presented graphically in Figure 2 shows the quantitative character of this disparity which has its origin soon after the first permanent tooth is attacked by caries. This disparity is maintained and continuously widens with increasing chronological age. The dental status of males (6-35 years of age) for whom such a disparity exists is shown graphically by Figures 3 and 4. These charts clearly indicate the large proportion of the caries experience which is formed at the present time, by extracted teeth, teeth indicated for extraction, and by tooth surfaces carious and awaiting treatment by fillings.

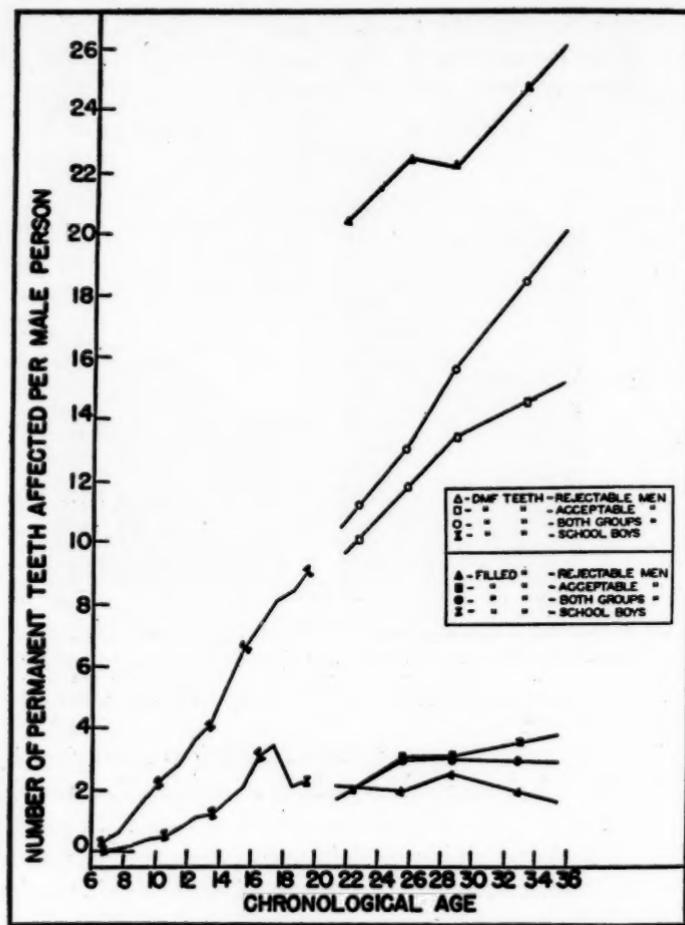


Fig. 2. Chronological age and the number of DMF permanent teeth and the number of filled permanent teeth per male person. Data derived from examination of approximately 3,000 elementary and high-school boys of Hagerstown, Maryland, and environs, and of approximately 640 men aged 21-35 years in Maryland and West Virginia.

It is well known that the prompt placement of fillings during

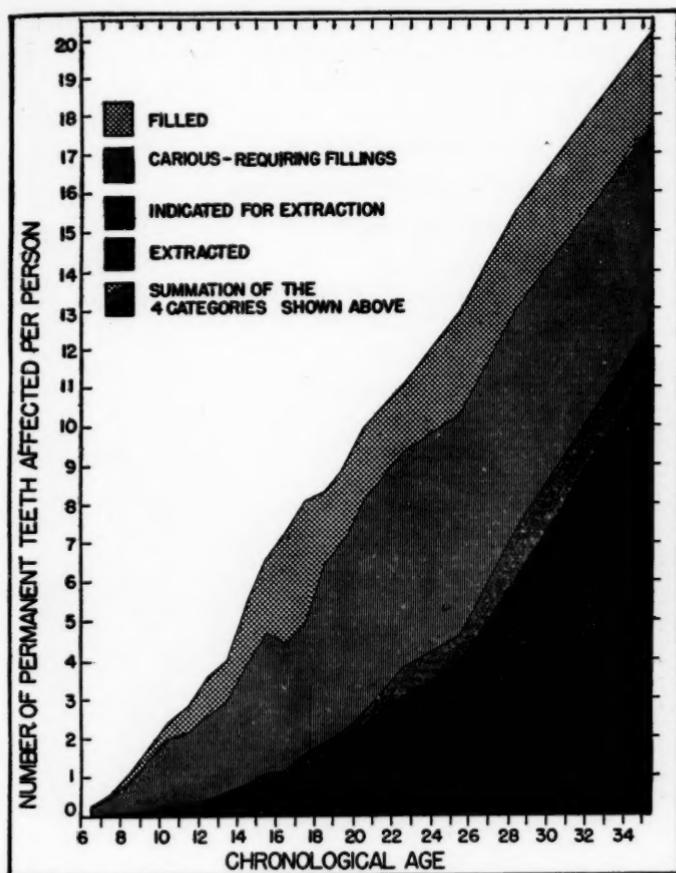


Fig. 3. Chronological age and the status of the permanent teeth. Data derived from examination of approximately 3,000 elementary and high-school boys in Hagerstown, Maryland, and environs, and of approximately 640 men aged 21-35 years in Maryland and West Virginia.

school attendance would have prevented a large share of the tooth loss observed in the men. Although present knowledge is not sufficient for the prevention of initiation of caries, the procedures of dentistry are sufficient to prevent dental rejectability even in persons

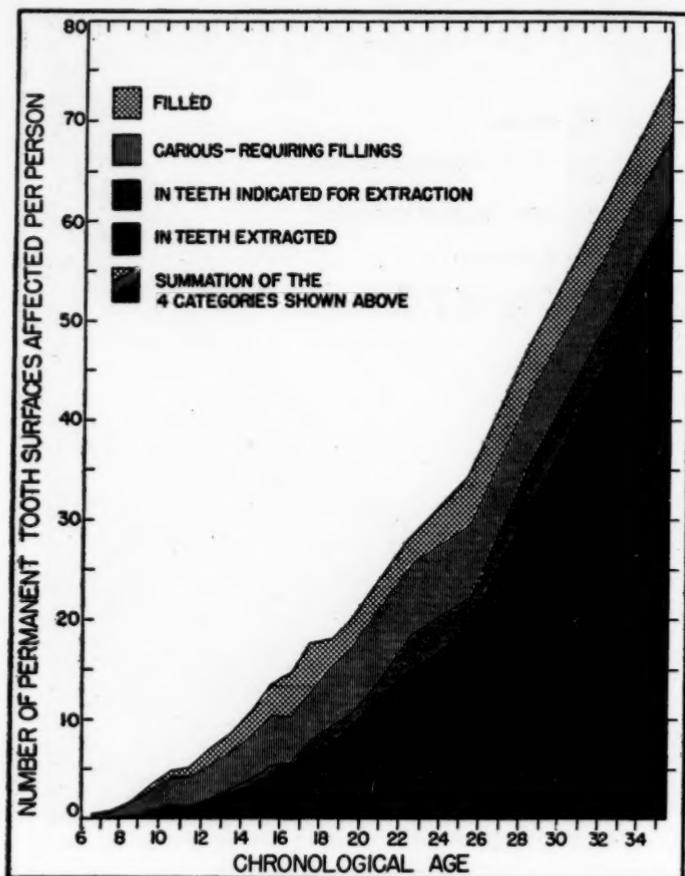


Fig. 4. Chronological age and the status of the permanent tooth surfaces. Data derived from examination of approximately 3,000 elementary and high-school boys of Hagerstown, Maryland, and environs, and of approximately 640 men aged 21-35 years in Maryland and West Virginia.

having marked caries susceptibility. If the prevention of dental rejectability be set up as an objective, it would be necessary to begin, at least at age 6 years, filling the teeth annually at a rate coincident with the rate at which carious lesions arise.

To reiterate, it is necessary to recognize that in general a new crop of caries develops each year in the permanent teeth from about age 6 years until practically all susceptible tooth surfaces have been attacked in late adult life. Thus the prevention of rejectability (as now defined) and the prevention of the *excessive accumulation* of need for fillings, and of dentures and bridges, in the rejectables and acceptables involves, until dental caries actually can be prevented, a systematic, perennial dental servicing problem, beginning in the first decade of life and continuing without interruption through the late adult ages.

THE REGIONAL APPROACH TO THE STUDY OF HIGH FERTILITY¹

RUPERT B. VANCE

THE regional approach to the study of high fertility has proved at the hands of our social demographers one of the happiest of scientific unions, that between statistics and geography. By the use of quantitative measures, notably the ratio of infants to 1,000 women of child-bearing age, it has delimited areas of excess fertility and furnished the rates of net replacement in terms of the operation of present mortality and fertility schedules over a generation. These studies indicate that the main areas of high replacement ratios tend to coincide with areas of high economic density, measured in terms of the relation of population to effective use of resources. The main areas are found to be the Southern Appalachians, certain tenancy areas of the Cotton Belt, and certain subsistence areas of the Southern coastal and tidewater subregions.

Roughly the two main approaches to the study of regional fertility differentials may be regarded as statistical and cultural. In the brief space at our disposal we may locate extra fertility in the Southeast² and show the extent to which the statistical approach has served to differentiate the region from the Nation. The second part of the paper may well be devoted to consideration of the cultural content of the high fertility complex.

PART I—DEMOGRAPHIC ASPECTS

Students of population are interested in the extent to which the

¹ A contribution from the Study of the Southern People, a project of the Institute for Research in Social Science of the University of North Carolina. All statistical computations are by Nadia Danilevsky, statistical assistant of the Institute. This paper was read in substantially its present form at the Nineteenth Annual Conference of the Milbank Memorial Fund.

² The delineation of the Southeast follows that developed by Howard W. Odum in *SOUTHERN REGIONS OF THE UNITED STATES*. Chapel Hill, University of North Carolina Press, 1936.

Southeast's high birth rate can be related to special conditions of the area, the extent to which the decline in fertility from 1920 to 1930 is due to changes in these conditions, and the effect that mortality now has on potential births. In addition we have calculated the region's comparative prolificacy rates, its schedule of marriage expectation, and the degree to which changes during the 1930's were due to migration and natural increase.

FACTORS IN THE SOUTH'S EXTRA FERTILITY

What is responsible for the Southeast's extra fertility? Do the people of the region have a higher birth rate because they are more rural, because they are younger, or because of their racial composition? To the extent that Southern fertility is found not to depend on these factors, it must be due simply to the tendency of women of given ages to have more children, that is to higher age-specific fertility.

When all factors affecting fertility in the Southeast are held as in the Nation, it simply means that we must assume that the population of the Nation has shrunk to the size of the Southeast, keeping all its specific birth rates unchanged. If in 1930 these four factors had been the same in the region as in the Nation, births in the Southeast (Table 1) would have been reduced by 82,760—a decrease of 14.6 per cent. National ratios in the distribution of races would reduce total Southern births by only .5 per cent; in rural-urban residence,⁸ by 2.5 per cent; in age, 3.2 per cent. Age-specific fertility is thus responsible for a reduction of 47,691 births or 8.4 per cent of the total number. Thus it can be seen that over half of the area's extra fertility is simply due to the tendency of women in the region—irrespective of race, rurality, or of age difference—to have more children. Given the race, the rural-urban, and the age distribution characteristic of the Nation, births in the Southeast would be reduced only 6.2 per

⁸ Urban population is here defined as in the Vital Statistics reports as population in cities of 10,000 or over.

ITEM	TOTAL		WHITE		COLORED	
	Number	Per Cent	Number	Per Cent	Number	Per Cent
Actual Number of Births in the Southeast	567,434	100.00	391,026	100.00	176,408	100.00
Estimated Number of Births (4 Factors as in U. S.)	484,674	85.42	428,131	109.49	56,543	32.05
Reduction in Number of Births Due to 4 Factors:						
Total	-82,760	-14.58	37,105	9.49	-119,865	-67.95
1. Age-Specific Fertility Rates as in U. S.	-47,691	-8.40	-39,329	-10.06	-8,362	-4.74
2. Urban-Rural Distribution as in U. S.	-14,088	-2.48	-14,106	-3.61	18	0.01
3. Age Composition as in U. S.	-17,847	-3.15	-14,625	-3.74	-3,222	-1.83
4. Race Composition as in U. S.	-3,134	-0.55	105,165	26.89	-108,199	-61.39

Table 1. Comparative importance of factors reducing the number of births in the Southeast under the assumption of conditions as in the United States in 1930.

Number of births not corrected for under-registration. Urban population includes cities of 10,000 inhabitants and over; rural—the rest of the population. Population of United States as for the Registration Area of 1930.

SOURCE: UNITED STATES BIRTH, STILLBIRTH, AND INFANT MORTALITY STATISTICS, 1930, Tables I and IV. STATISTICAL ABSTRACT OF THE UNITED STATES, 1937, Table II.

cent. This higher specific fertility may be taken as an index of the lag in the practice of family limitation in the region.

REGIONAL PROLIFICACY RATES

Extra fertility of the Southeast can be shown by the computation of prolificacy rates after the methods devised by Lotka and Burks and developed by Whelpton and Jackson.⁴ Table 2 indicates for the Nation and the Southeast the percentage distribution of wives by the number of births according to current fertility and life tables. In

⁴ See Whelpton, P. K. and Jackson, Nelle E.: Prolificacy Distribution of White Wives According to Fertility Tables for the Registration Area. *Human Biology*, February, 1940, xii, No. 1, pp. 35-58.

NUMBER OF BIRTHS	1919-1921		1929-1931	
	United States	Southeast	United States	Southeast
0	12.0	9.5	23.1	19.1
1	20.6	14.1	20.0	17.8
2	17.7	14.0	19.4	17.8
3	13.8	13.4	12.1	10.7
4	10.2	8.8	7.7	8.0
5	6.8	7.7	4.9	6.0
6	5.0	6.9	3.6	4.7
7	3.8	6.3	2.4	3.9
8	3.1	5.3	2.0	3.3
9	2.3	4.9	1.5	3.2
10 and Over	4.7	9.1	3.3	5.5

Table 2. Prolificacy rates of white wives in the United States and the Southeast, 1919-1921 and 1929-1931.

NOTE: Prolificacy rates give the percentage distribution of wives by number of births according to current fertility, marital status, and life tables. Prolificacy rates for the United States computed by P. K. Whelpton. All births corrected for under-registration. Only legitimate births are taken into account. The Southeastern rates for 1929-1931 computed on the basis of the order of births in 1930.

SOURCE: "Prolificacy Distribution of White Wives According to Fertility Tables for Registration Area," by P. K. Whelpton and N. E. Jackson. *Human Biology*, XII, February, 1940, p. 54. Sources given in Table 3.

1930 we find the Nation led in the proportion of white wives with three children or less. Only 65.4 per cent of white wives in the South had three births or less as compared to 74.6 per cent in the Nation. Both areas showed great increase from 1920 to 1930 in the proportion of small families, the largest increase being in the zero order of births. In 1930, 23.1 per cent of the wives in the Nation and 19.1 per cent of those in the Southeast had no births. In the proportion with six or more births, the region has 20.6 per cent of its white wives as compared to 12.8 for the Nation.

Comparison of prolificacy distribution as between white and colored women in the Southeast (Table 3) is made difficult by the high percentage of Negro illegitimacy, reaching about 13 per cent of all births in 1930. Illegitimate births are largest among first-order births, but with these counted a much larger proportion of Negro wives are found to have one or no children. Table 3 shows that 27 per cent of Negro women have no births as compared to 19 per cent

of white women, while 28.8 per cent Negroes have one birth as compared to 17.8 per cent of white women.

MARRIAGE EXPECTATION

High fertility of a population, as often pointed out, is accompanied by a greater frequency of marriage and younger age of marriage. Our calculations (Table 4) indicate that women in the Southeast have a high rate of expectation of marriage to speak in terms of the

life table. At survival and first marriage rates prevailing in the region in 1930 we estimate that at birth 83.3 per cent of white females will live to be married. Similar calculations for Negroes give a percentage of 77.9. These ratios are low partly because of the toll that mortality takes before these females reach nuptial age. At its highest point, age 10 for whites and 15 for colored, the rate is 90.8 per cent first marriage expectancy for whites and 88.5 per cent for colored. After this age the rate diminishes until few of the women left single at age 45 can look forward to marriage. According to our calculations, 17.9 per cent of the single colored women of 45 and 3.2 per cent of the white women will marry. Marriage expectancy rates for the national population have not yet been calculated.

THE DECLINE IN BIRTHS 1920-1930

Following the method developed by Thompson and Whelpton,

NUMBER OF BIRTHS	1919-1921	1929-1931
0	18.1	27.0
1	29.7	28.8
2	9.0	10.9
3	6.7	6.2
4	7.0	4.2
5	4.8	4.2
6	4.3	3.8
7	4.0	2.9
8	4.3	2.9
9	2.7	1.8
10 and Over	9.4	7.3

Table 3. Prolificacy rates of colored wives according to current fertility and life tables in the Southeast, 1919-1921 and 1929-1931.

NOTE: Life tables computed on the assumption of 100,000 new-born girls. All births corrected for under-registration. For white and colored wives all births (legitimate and illegitimate) are taken into account. Order of births is computed for colored as of 1920 and 1930.

SOURCE: UNITED STATES BIRTH, STILLBIRTH, AND INFANT MORTALITY STATISTICS, 1930, p. 243, Table 7; p. 232, Table 6; p. 15, Table Q. UNITED STATES BIRTH STATISTICS, 1919, 1920, 1921: Tables 7 and 8. Sources quoted in Table 1, 37 (Age-specific fertility rates by color) and Table 23 (Abridged Life Tables, 1929-1931, Southeast). United States Life Tables, 1930, prepared by the Bureau of the Census, Tables IV B and IV D.

AGE x	FEMALE SURVIVORS AT AGE x	PER- CENTAGE MARRIED AT AGE x	NUMBER MARRIED SURVIVORS AT AGE x	NUMBER	NUMBER	CUMULA- TIVE	NUMBER	MARRIAGE
				DEATHS AMONG MARRIED DURING INTERVAL x TO x+5	FIRST MARRIAGES DURING INTERVAL x TO x+5	NUMBER MARRIAGES TO AGE x	SINGLE SURVIVORS AT AGE x	EXPECTA- TION AT AGE x
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
0	100,000	0	0	0	0	83,301	100,000	83.3
5	92,975	0	0	0	0	83,301	92,975	89.6
10	92,273	0	0	0	0	83,301	92,273	90.3
15	91,751	0	0	186	42,032	83,301	91,751	90.8
20	90,772	46.10	41,846	933	26,549	41,269	45,926	84.3
25	89,436	75.60	67,462	1,417	9,726	14,720	21,774	67.6
30	87,505	86.59	75,771	1,807	3,398	4,994	11,734	42.6
35	85,473	90.51	77,362	2,050	930	1,596	8,111	19.7
40	83,224	91.61	76,242	2,386	465	666	6,982	9.5
45	80,626	92.18	74,321	2,813	301	301	6,305	3.2
50	77,582	92.43	71,709					

Table 4. Marriage expectation table for white women in the Southeast, according to marital status as of 1930 and mortality rates of 1929-1931.

SOURCE: FIFTEENTH CENSUS OF THE UNITED STATES, 1930, Population, II, Chap. II, Tables 9, 17, 18, 19; Chap. 10, Table 28. All sources necessary for the computation of life tables for the Southeast.

we have attempted to measure the influence of factors related to the decline in births in the Southeast from 1920 to 1930 (Table 5). Statistically these factors can be segregated by race, age-sex composition, rural-urban residence, and specific fertility. The decline in age-specific fertility was found to be of much greater importance than all other changes in population composition. The 641,689 births occurring in 1929-1931 amounted to 88.1 per cent of the births in 1918-1921. Twelve per cent of the births, however, were due to the increase in the numbers of the population of 1930 over 1920. Changes in age-sex composition were actually favorable to a slight increase of 2.2 per cent in births while changes in rural-urban distribution accounted for a loss of only 1.6 per cent. Thus for the total population of the Southeast, the decline in specific fertility accounted for a loss of 180,803 births, a decline of 28.8 per cent from the 1918-1921 level.

For the total population, changes in race composition accounted for practically no differences. For the white population considered

separately it meant a gain of 4.3 per cent in births, for the colored a loss of 8.6 per cent. Change in rural-urban distribution meant slight losses in births—1.5 per cent for the white and 1.9 per cent for the colored. The change in age-sex distribution favored increased births for both races, 2.4 per cent among the white and 1.8 per cent among

Table 5. Actual difference in number of births by color and its component parts due to change of various factors from 1920 to 1930 in the Southeast.

ITEM	TOTAL		WHITE		COLORED	
	Number	Per Cent	Number	Per Cent	Number	Per Cent
Number of Births in 1918-1921 ¹	729,083	100.0	490,667	100.0	238,416	100.0
Number of Births in 1929-1931 ¹	641,689	88.1	441,360	90.0	200,329	84.0
Actual Change in No. of Births from 1920 to 1930 (5 Factors as of 1930)	-87,394	-11.9	-49,307	-10.0	-38,087	-16.0
1. Due to Size of Population as of 1930	89,021	12.1	59,910	12.1	29,111	12.1
2. Due to Age-Specific Fertility Rates as of 1929-1931	-180,803	-28.8	-134,324	-27.4	-46,479	-19.5
3. Due to Age and Sex Composition as of 1930	15,848	2.2	11,605	2.4	4,243	1.8
4. Due to Urban-Rural Distribution as of 1930 ²	-11,859	-1.6	-7,401	-1.5	-4,458	-1.9
5. Due to Race Composition as of 1930	399	0.05	20,903	4.3	-20,504	-8.6

¹ Number of births in 1929-1931 and in 1918-1921 corrected for under-registration by Whelpton's method.

² Urban includes cities of 10,000 inhabitants and over; rural—remaining population.

NOTE: Method adapted from Thompson and Whelpton, *POPULATION TRENDS IN THE UNITED STATES*, p. 213.

SOURCE: National Resources Committee, October 1937, *POPULATION STATISTICS, STATE DATA*, pp. 3 and 7; *FOURTEENTH CENSUS OF THE UNITED STATES: 1920, Population*, Vol. II, Chapter 3, Table 13; Vol. III, Table 10; *FIFTEENTH CENSUS OF THE UNITED STATES: 1930, Population*, Vol. II, Chapter 10, Table 24; Vol. III, Table 12; *UNITED STATES BIRTH, STILL-BIRTH, AND INFANT MORTALITY STATISTICS: 1918-1921 and 1929-1931*.

the colored population. For the whites the decline in age-specific fertility accounted for the greater loss in births, a decline of 27.4 per cent as compared to a loss of 19.5 per cent of the Negro births as of 1920. Negroes suffered a greater loss of potential births, 16 per cent as compared to 10 per cent among whites. Part of their losses can be laid to interregional migration since they lost 8.6 per cent of 1920 births by changes in race distribution in contrast to a 4.3 per cent gain among white groups.

Several conclusions emerge from this analysis. It is true that specific fertility irrespective of race, residence, and age-sex composition accounts for higher reproduction in the Southeast. The Southeast appears to have a fertility differential in excess of what can be accounted for by other measurable demographic and social characteristics. The calculation of specific fertility by income status, if it were possible, might account for much of this disparity. It is also shown that the decline in specific fertility is more important than all other changes in reducing reproduction in the region from 1920 to 1930. The figures indicate, as we shall see later, that the process continued in the period 1930-1940.

THE EFFECT OF MORTALITY ON BIRTH RATES
IN THE SOUTHEAST 1920 AND 1930

What is the effect of deaths of mothers, actual and potential, on births in the Southeast? The loss in potential births because of mortality among women in the child-bearing ages, 15 to 50, is very small, falling under 1 per cent of all births for the period 1929-1931. The great losses in births thus come from the deaths of women before age 15, largely infant mortality. Table 6 shows that according to the fertility and mortality rates of 1929-1931, the annual differences in births caused by the deaths of white women from birth to age 50 was 59,030—equal to a loss of 13.4 per cent of annual births in the actual population of 1930. For 1918-1921, the loss was much greater, 104,139, or 21.2 per cent of actual births. Deaths of colored women

PERIOD AND AGE GROUP	WHITE		COLORED	
	Actual No. Births	No. Births Lost	Actual No. Births	No. Births Lost
<i>1929-1931</i>				
15-19	63,545	6,086	47,373	7,750
20-24	133,909	14,812	63,751	13,486
25-29	107,722	14,190	40,505	11,199
30-34	70,504	11,022	24,630	8,771
35-39	47,177	8,760	17,808	8,045
40-44	16,763	3,700	5,347	3,074
45-50	1,740	460	915	676
TOTAL	441,360	59,030	200,329	53,002
<i>1918-1921</i>				
15-19	58,674	8,474	48,486	11,196
20-24	140,329	23,836	73,615	22,388
25-29	122,014	25,026	51,019	20,316
30-34	84,896	20,880	30,267	15,509
35-39	61,107	17,781	25,456	16,358
40-44	21,303	7,230	7,807	6,204
45-50	2,344	912	1,766	1,765
TOTAL	490,667	104,139	238,416	93,736

Table 6. Actual number of births and yearly number of births lost due to mortality of women from birth to the end of the reproductive period in the Southeast, 1929-1931 and 1918-1921.

SOURCE: National Resources Committee, *POPULATION STATISTICS, STATE DATA, pp. 3 and 7; FOURTEENTH CENSUS OF THE UNITED STATES: 1920, Population, Vol. II, Chapter 3, Table 13; FIFTEENTH CENSUS OF THE UNITED STATES: 1930, Population, Vol. II, Chapter 10, Table 24; UNITED STATES MORTALITY STATISTICS: 1929, 1930, 1931; Mary Gover, Mortality Among Southern Negroes Since 1920, *Public Health Bulletin* No. 235, p. 8; Lorimer, Frank and Osborn, Frederick: *DYNAMICS OF POPULATION*, Appendix B, p. 356.*

exact a much greater toll—26.5 per cent of annual births in 1929-1931 and 39.3 per cent in 1918-1921.

It may be of interest to relate these calculations to the birth rate of the region. The actual birth rate in 1930 (with number of births averaged for the period 1929-1931) was 25.0. If none of the births had been lost, the rate would have been 29.4. In 1920 (births averaged for 1918-1921) the actual birth rate was 31.9 for the total population. If all mothers had been saved from death from age 0 to 50, the birth rate would have been 40.5 per thousand. It is evident that these contrasting figures combine the two trends of lowered mortality and lowered fertility from 1920 to 1930 in the Southeast.

These calculations lead us to significant conclusions. As the South becomes more like the Nation, its births will decline; but as health conditions improve, births would presumably rise. Contraception for the masses thus would become more important as an issue.

REGIONAL CHANGES, 1930-1940: MIGRATION
VERSUS NATURAL INCREASE

It is now possible to apportion recent changes in population between the factors of migration and natural increase. Census figures (Table 7) indicate that from 1930 to 1940 the Southeast increased its population by 10.1 per cent—a rate which exceeded that of all other regions except the Far West. The Southeast's increase of 2,710,931 was the Nation's largest, making up over 30 per cent of the Nation's total natural increase.

The reduction of regional changes to their constituent elements of natural increase and migration shows what is happening in the Nation. Subtraction of the excess of births over deaths during the decade, 1930-1940, shows that the Far West was the only region to show an appreciable gain by migration, 15 per cent.

Table 7. Total change in population, natural increase, and migration movement during the decade, 1930-1940, in the United States and six regions.

AREA	TOTAL CHANGE		NATURAL INCREASE		MIGRATION MOVEMENT	
	Number	Rate ¹	Number	Rate ¹	Number	Rate ¹
UNITED STATES	8,894,229	7.0	8,120,596	6.4	773,633	0.6
Northeast	1,940,298	5.0	1,746,995	4.5	193,303	0.5
Middle States	1,780,130	5.1	1,866,716	5.4	-86,586	-0.3
Southeast	2,710,931	10.1	2,750,392	10.2	-39,461	-0.1
Southwest	702,692	7.5	863,653	9.2	-160,961	-1.7
Northwest	25,938	0.4	635,269	8.6	-609,331	-8.1
Far West	1,558,018	17.2	228,539	2.5	1,329,479	14.7

¹Average annual rate per 1,000 population.

SOURCE: SIXTEENTH CENSUS OF THE UNITED STATES, 1940: Population, preliminary release of March 22, 1941, Series PH-3 (final data); STATISTICAL ABSTRACT OF THE UNITED STATES: 1933, 1935, 1937, 1939; and VITAL STATISTICS, *Special Reports*, Vol. 12, No. 9.

The major gains of every area except the Far West came from natural increase but no region topped the Southeast in this respect. She gained 2,750,392 new souls by the balance of births over deaths and lost only 39,461 by outward migration.

Shifting trends in birth and migration can be shown by comparison of these actual changes with the changes that were estimated by Thompson and Whelpton (Table 8) under the two assumptions of (1) no migration and (2) of migration as of 1920-1930. The pattern of interstate migration prevailing during the decade 1920-1930 did not carry over to 1940. The only region for which the "prediction" of migration was close is the Southwest with a loss of 189,000 "forecast" as against 161,000 actual loss. For the Far West actual immigration exceeded immigration assumed by 242,000, and the Northwest exceeded the out migration assumed by 161,000. Where the Northeast was assumed to gain 912,000, it gained only 193,000; where the Middle States were assumed to gain 318,000, they lost over 87,000. The Southeast fell below the out migration assumed from the 1920-1930 pattern by 1,667,000.

Equally significant are the regional contrasts shown in natural increase (Table 8). Areas of low fertility, Northeast, Middle States, and Far West, show greater gains in natural increase than was assumed. Areas of high fertility, the Northwest, Southwest, and Southeast, show much greater decline in natural increase than was expected in the Thompson-Whelpton forecasts. Had out migration reached the heights attained in 1920-1930, the Southeast was expected to show a natural increase of 3,105,000. Actual increase was only 2,750,000. Thus the expected average annual rate of natural increase of 11.8 per 1,000 fell to 10.2. In the Southwest the expected rate of 11.9 gave 9.2 as the actual rate; in the Far West the change from expected to actual rate was from 2.1 to 2.5; in the Northwest from 9.2 to 8.6. We may help to account for these changes by examining the assumptions underlying the Thompson-Whelpton estimates. Thompson and Whelpton assumed that in the

Table 8. Actual change in population during the decade 1930-1940 and estimated change under two assumptions in the United States and six regions. (Population in thousands.)

ITEM AND ASSUMPTION	UNITED STATES	NORTH- EAST	MIDDLE STATES	SOUTH- EAST	SOUTH- WEST	NORTH- WEST	FAR WEST	D. C.
Population, 1930	122,775	38,026	33,961	25,551	9,080	7,385	8,285	487
Population, 1930 ¹	123,233	38,153	34,077	25,670	9,118	7,412	8,312	488
Population, 1940								
Actual	131,669	39,966	35,742	28,262	9,782	7,410	9,844	663
Est: No Migration	132,098	39,853	35,940	28,908	10,278	8,137	8,500	488
Est: With Migration	131,865	40,754	30,215	27,069	10,068	7,056	9,586	513
Total Change (1930-1940)								
Actual	8,894	1,940	1,780	2,711	703	26	1,558	174
Est: No Migration	8,865	1,700	1,863	3,238	1,160	725	188	0
Est: With Migration	8,632	2,601	2,138	1,399	950	244	1,274	25
Natural Increase (1930-1940)								
Actual	8,121	1,747	1,867	2,750	864	635	229	29
Est: No Migration	8,865	1,700	1,863	3,238	1,160	725	188	0
Est: With Migration	8,632	1,689	1,820	3,105	1,139	692	187	0
Gain or Loss Through Migration (1930-1940)								
Actual	774	193	-87	-39	-161	-609	1,329	145
Est: No Migration	0	0	0	0	0	0	0	0
Est: With Migration	0	912	318	-1,706	-189	-148	1,087	25
Average Yearly Rate of Change ²								
Actual	7.0	5.0	5.1	10.1	7.5	0.4	17.2	30.3
Est: No Migration	6.9	4.4	5.3	11.9	12.0	9.3	2.2	0.0
Est: With Migration	6.8	6.6	6.1	5.3	9.9	3.2	14.2	5.1
Average Yearly Rate of Natural Increase ²								
Actual	6.4	4.5	5.4	10.2	9.2	8.6	2.5	5.0
Est: No Migration	6.9	4.4	5.3	11.9	12.0	9.3	2.2	0.0
Est: With Migration	6.8	4.3	5.2	11.8	11.9	9.2	2.1	0.0
Average Yearly Rate of Migration ²								
Actual	0.6	0.5	-0.3	-0.1	-1.7	-8.2	14.7	25.3
Est: No Migration	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Est: With Migration	0.0	2.3	0.9	-6.5	-2.0	-6.0	12.1	5.1

¹ Population as enumerated on April 1, 1930 corrected by adding an allowance of 4 per cent for under enumeration of children under 5. Since the forecasts of Thompson and Whelpton are based on this corrected figure, it has been used in computing changes in population predicted by them, while "actual" changes were computed on the basis of Census enumeration in 1930 and 1940. Some discrepancies in the last digits of totals are due to the rounding of figures in thousands.

² Annual rate per 1,000 population. Rate of natural increase computed on the assumption of equal increase per year, that is, the total increase during the decade was divided by 10 and related to the mid-value of populations in 1930 and in 1940. The total natural increase computed from January 1, 1930 to January 1, 1940, since final data for the three first months in 1940 were not available.

SOURCE: Estimates of Future Population by States by W. Thompson and P. K. Whelpton, National Resources Board, December, 1934, mimeographed. Sources given in Table 7.

Nation as a whole the birth rate for five-year age periods would drop about 30 per cent from 1930 to 1960, and that by 1960 "the difference between the United States birth rate and that for the urban and rural population of each state would be only one-half as great as in 1930." Two trends seem evident from the 1940 figures: (1) in states of low fertility the birth rate is not falling as rapidly as assumed; (2) in states of high fertility births are falling at a higher rate than that assumed.

PART II—CULTURAL STUDIES

Many students no doubt feel that the statistical approach to the study of high regional fertility has stopped short of the level of scientific explanation needed for the understanding of the phenomena or the implementation of social policy. In contrast, however, cultural studies of the high fertility complex in folk regional areas are few and far between.⁶ It is safe to say that none of the attempts yet published satisfy the criteria established by anthropology for cultural studies or those set up by social psychology for studies of motivation and attitudes.

Admitting the obvious difficulties faced by such studies, we may well discuss two unsolved problems of theory and method in this field. The first has to do with the involved relation of that culture complex known as the standard of living to the actual level of living as affected by the size of the family. Here we may well inquire as to what extent groups with excess fertility possess standards higher than their actual levels of living. The second unsolved problem is reached when we ask why standards do not go over into family limitation practices. This question should also be attacked as a

⁶ A cooperative study of social and psychological factors affecting fertility among a selected native-white group in Indianapolis is now being made under the auspices of the Milbank Memorial Fund, with grants from the Carnegie Corporation of New York. A progress report was presented by P. K. Whelpton, field director of the investigation, at the Nineteenth Annual Conference of the Milbank Memorial Fund. For a summary of the report, see: Reed, Lowell J.: Research in Factors Influencing Fertility. *American Journal of Public Health*, September, 1941, xxxi, No. 9, pp. 984-985.

problem in the culture complex. It leads to a consideration of folk attitudes toward sex behavior in the marital relation.

STANDARDS OF LIVING

The point should be made early in the discussion that phenomena related to the standard of living and the pattern of fertility can be viewed from both the cultural and the individual point of view. Individual variations based on differences in intelligence and cultural participation should be expected, but within comparatively isolated folk, regional, and class groups there will be found modal attitudes that blanket these homogeneous communities. Homogeneity is likely to prevail in such areas because standards are limited in two ways: first, to what is known by communication; and second, to what is attainable by economic status. A tenant family will hardly be concerned with keeping up with the Joneses, (1) if there are no Joneses within their ken, or (2) if the Joneses they encounter have standards that are completely out of reach. Marriage in such folk groups is likely to be delayed only until the worker gains a competence equivalent to that of his peers, and fertility may be limited little or not at all.

The implications of the cultural point of view may be further explored. We have been told by practically every study in the field that contraceptives, including widely known folk methods, are only the means or mechanics of family limitation. The motivation to their use must come largely from the family's desire to attain or maintain a certain standard of living. Here we are concerned with groups on whom the ordinary prudential controls weigh so lightly that such means are but little used. Stix and Notestein rightly point out that "the situation will not be rapidly altered merely by making modern contraception available to populations that have not utilized the folkway methods at their disposal. There must also be the will to reduce fertility."⁴

⁴ Stix, R. K. and Notestein, F. W.: *CONTROLLED FERTILITY*. Baltimore, The Williams and Wilkins Company, 1940, p. 152.

So far our analysis has shown the association of low levels of living with high fertility but it has not explained that association in terms of values and attitudes, that is, of the culture content of the standard of living of these groups. Thus the introduction of contraceptive practices involves the invasion of new values and the adoption of new attitudes—not merely the acceptance of an efficient technique.

The structure of prevailing attitude is to be found in the cultural content of the standard of living. If there exists the validity assumed in the distinction between the standard of living and the level of living, this distinction should be of value in determining why folk and other methods of family limitation are not more widely used.

The question involved may be posed in such fashion as to bring out the distinction between standards and actual levels of living. Is it possible, for example, that a people can be led to raise their standard of what they expect from life without having first experienced an increase in their actual levels of living? We so often see this accomplished by highly motivated individuals that we may feel it is unnecessary to ask the question about groups.

Such a question intimates that a group may glean a cultural definition of the situation from something other than cultural experience. The experiencing which conditions the motivation to raise standards would thus be vicarious and symbolic, deriving from verbal conditioning.

Concretely, the calculation of a standard versus a level of living is best carried on in a money economy by an informal process of balancing the books of a family budget. The subsistence areas of the Appalachians and the credit and "furnish" system of southern tenancy areas, it must be recalled, have largely remained outside the cash nexus of our money economy. This is especially true in relation to the economics of large families. Initial costs of child birth and prenatal care are met by the minimum services of midwives and neighborhood help. The system of cost accounting and anticipation

forced on the urban dweller is largely evaded and only gradually makes its appearance as the number of children increases in the rural household. Deferred payments and do-without enter largely into the lower level of living which creeps with less evident calculation upon the growing family in agrarian areas. Less is done for children in such culture areas, and more is expected from them in cooperative farm work and family labor—an evasion which the city dweller cannot make.

We may ask what, for example, does high-school education, slowly making its way among some of these groups, do for those in the lower levels? It is usually assumed that such acculturation operates to raise standards and lower fertility, and that these trends then go over into increased incomes and improved levels of living. We have many campaigns to raise the levels of living of groups. What would happen to a campaign which, making no attempt to increase incomes, attempted to raise a peoples' standards?

One of the techniques of revolution, it is pointed out, has been found in the attempt to raise a peoples' expectations and standards above any reasonable hope of immediate attainment. The resulting tension is then assumed to offer the motivation for revolt. In the economic field this would involve changes in the cultural definition of the situation based not on experienced reality but on vicarious and symbolic experience, founded on propaganda or education.

Negatively, a lowering of actual levels of living should operate to restrict fertility in a way that the attempt to achieve a rising standard has not attained among folk groups. That this is no idle theory is indicated by the one example of Ireland. A dire famine that threatened, rather destroyed, subsistence for many has given that country the lowest marriage rate in the world. Ireland is the one country which followed Malthus' advice; namely, limitation of population increase by practice of "delayed marriage with moral restraint." Carr-Saunders has shown that from 1841 to 1926 the proportion of females aged 25 to 35 who were unmarried rose from 28 to 53 per

cent. For those who marry, age-specific fertility has fallen but little. What Ireland accomplished by following Malthus and the Catholic Church, other peoples do by family limitation when their standards are threatened. Yet the socially isolated mountain people, rural Negroes, and farm tenants who have not been led to adopt contraceptive practices by an urge to raise standards in a subsistence or a credit economy do accept family limitation when they migrate to cities. Any serious threat to their present low levels of living might also reduce fertility.

Studies by T. J. Woofter show that in 1930 there were just about twice as many youth in the farm population as are needed for replacement in agriculture. The surpluses of farm youth were greatest in the areas of lowest agricultural opportunity. If, in addition to the farm operators who will die in the next twenty years, every farmer who reaches 65 would retire, the farms they vacate would make room for only 2.7 million farmers. But during the same period, 6,000,000 boys now living on farms will have reached 20 years of age. If they tried to enter farming, there would be 225 young men competing for every 100 farms available. In the Southeast, these same calculations give 300 applicants for every 100 farms; in the Southern Appalachian, approximately 350 for every 100 farms.

In the expansive period of cotton culture, farm youth lacking capital and experience were able to enter marriage and agriculture at the same time on the low level of cropper tenancy. Today these openings are closed, and the displacement of farm tenants and the threatened disintegration of the system suggests certain comparisons with the situation of the Irish peasantry. Such drastic changes may operate to delay marriage and depress fertility at a faster rate than anticipated.

SEX ATTITUDES

Sex behavior has its motivations no less than economic behavior. Sex attitudes of the folk in the marital relation deserve more discus-

sion in this connection than they have yet received. One of the contributions of Margaret J. Hagood's study of farm tenant mothers was to show that among the folk this relation is not often discussed between husband and wife, and that moreover, there exists no scientific or objective terminology in which it can be discussed.⁷

Mrs. Hagood found that the general attitude of not wanting more children was unaccompanied by any general practices designed to prevent their conception. Of sixty-nine tenant farm mothers questioned only eight used contraceptives. Nevertheless thirty-seven out of forty-two expressed opinions favoring birth control. She found a common complaint that "doctors tell you not to have any more children but won't tell you nothing to do about it." Fourteen asked directly what to do.

This attitude on the part of farm mothers is one of hopeless resignation rather than one of either revolt or prudential control. Revolt would involve negative attitudes toward customary morality, toward religion, and toward their husbands to whom they acknowledge affection and duties. Prudential behavior would involve more control over marital relations than can be assumed of wives in the folk group.

Here we may be confronted by a masculine-feminine dichotomy which is not resolved by interaction in the marriage relation. In patriarchal cultures the consideration of these questions of family limitation may go by default, largely because of the unseen factors of masculine aggression and dominance in the sex relation. Folk methods of family limitation are not used and technical methods which depend upon the initiative of the wife are not introduced. Here we need a knowledge of the sex and fertility attitudes of husbands comparable to that of the mothers studied by Mrs. Hagood.

Masculine domination, however, is but a partial approach if we admit validity to the previous discussion of economic status and

⁷ Hagood, Margaret J.: *MOTHERS OF THE SOUTH*. Chapel Hill, University of North Carolina Press, 1939, pp. 122-125.

standards of living. One would find, no doubt, that among husbands the conflict between prudential and hedonistic motives had given rise to a resignation involving rationalization similar to that of the wives. The uncovering of such attitudes, however, would be much more difficult.

It is now realized that the most optimistic assumption of the early birth-control movement was that of an ideal contraceptive that would place little or no restraint on the pleasure principle. We now realize that the libido will be subject to prudential restraint and that the motivation of this behavior among folk groups must come from economic pressures that represent the resolution of forces and motives engendered by desires for an improved level of living. Much has been said of the place of contraceptive clinics in the public-health program. I would also add that public-health programs devoted to the diffusion of better prenatal and obstetric care, if at all implemented in economic terms, would do much to raise standards and thus lower fertility among folk groups. The more care that is devoted to each child under the influence of rising standards, the fewer children the family in any cultural group is likely to have.

A COMPARISON OF THE MORBIDITY OF HAGERSTOWN, MARYLAND, SCHOOL CHIL- DREN IN 1921-1925, 1935-1936, AND 1939-1940¹

ANTONIO CIOCCO, W. R. CAMERON, AND ELIZABETH BELL

INTRODUCTION

IN 1921 the United States Public Health Service initiated a survey of absenteeism caused by sickness among the white pupils of the Hagerstown, Md., schools. The results of this investigation, which continued without interruption until 1925, have been described by Collins (3, 4, 5, 6). During the school year 1935-1936 a similar survey utilizing the same technique for collecting the data was again undertaken by the United States Public Health Service but the resulting information remained inedited. Beginning with September, 1939, and as part of a program of studies concerned with various phases of the health of children and of morbidity and mortality in familial aggregates (1), the survey of the causes of absences of school children was resumed with the assistance of a National Youth Administration project.²

The principal data regarding the causes of absence for the school year 1939-1940 are now at hand and in this paper they will be compared with results published by Collins for the period December, 1921, to May, 1925, and with results of the survey made in the school year 1935-1936. During the years between 1921 and 1940 the mortality of children has declined. In addition, medical supervision of the health of school children has increased in this and other communities and, in general, medical care of children is now more readily

¹ From the Division of Public Health Methods, National Institute of Health, and the Washington County Health Department, Hagerstown, Md.

² The authors take this occasion to express publicly their deep appreciation of the generous cooperation and great interest manifested in this and other investigations by the former superintendent of the Hagerstown schools, Mr. B. J. Grimes; and by the present superintendent, Mr. B. C. Willis; and by the principals and teachers of the public schools; by Rev. Father J. C. Leary of St. Mary's Catholic Parish; Sister Hermes, principal of the school; and by all the teachers.

available than before. Therefore, it is desired to learn how this progress is reflected in the pattern of sicknesses causing school absences.

THE METHOD OF RECORDING ABSENTEEISM

The technique employed in recording school absences in the 1921-1925 survey has been described at length by Collins. That procedure, which was also followed in 1935-1936, consisted in supplying the teachers with forms on which they noted the name of each absent child, the dates and duration of absence, and the cause. Every week a representative of the United States Public Health Service collected these forms and the information thereon was transferred to individual cards. When the current survey was planned it was decided to alter somewhat this technique. In the first place, it was considered desirable to reduce the work and responsibilities of the teachers. Second, the main objective of the whole investigation was to inquire into the incidence and spread of certain illnesses and therefore a continuous and immediate check was required on the causes

Fig. 1a.

of absence, a check not limited to the school but also extended to the home of the child.

The preparatory step in the organization of the current survey was to obtain from the school enrollment lists the name of each child and any other pertinent information. This information was recorded on the individual card reproduced in Figure 1a. The cards pertaining to the children of a school were maintained in that particular school and arranged alphabetically and according to school room or class. A set of files was used for each of the following six categories: Children currently present in school, children already absent one-half day, those absent one day, those absent two days, those already absent three days or more, and children present currently but who had not yet furnished information on the cause of previous absences. In each school the care of the files was entrusted to one or two clerks furnished by the National Youth Administration and was under the daily supervision of one of the authors. (E.B.).

Fig. 1b.

1. Twice a day the teacher listed or had listed the names of the absentees on the form illustrated in Figure 1b.
 2. The clerk in charge of the files collected the absentee lists and

School _____		
Name _____	Grade _____	Room _____
The parent (guardian) is requested to give the following information regarding the absence of the child and to sign this slip.		
Reasons for absence: <i>Sickness</i> _____	<i>Other reasons</i> _____	
Check the appropriate reason		
In case absence was due to sickness:		
What was it? _____		
How long was the child ill? _____		
Was the physician called? _____		
Name of physician if called: _____		
Date: _____	Signed: _____	Mother, father, guardian

Fig. 1c.

promptly removed the card of each absentee from the "present" file, recorded the date of the beginning of the absence, and placed the card in the "half day absent" file. If the child's name reappeared on the subsequent absentee list, the card was moved to the "one day absent file," and so on.

3. On the child's return to school the date of return and the cause of absence were recorded on the card which was then replaced in the "present" file unless the reason for absence had not been obtained. In this case, the child was furnished with the excuse slip shown in Figure 1c and instructed to have it filled out at home and to return it.

The correctness of the information about the cause of absence was verified mainly by contacts with the parents. In every case when a child had been absent three days or more a visit was immediately made to the home. When a physician had been called his cooperation was also enlisted in order to learn the precise diagnosis made.

After a year's experience, under varying conditions of school discipline and organization and during periods of unusual absenteeism associated with disease or weather conditions, the procedure described proved to be entirely satisfactory. Since it offers an opportunity for the execution of epidemiological or similar investigations, it is brought to the attention of those interested in the study of the

health of school children. In our experience a clerk working two and a half to three hours daily is able to keep posted the file of a school of 500 children. Clerks furnished by the National Youth Administration were utilized in the present survey, but it is obvious that other types of volunteer or paid clerks could be employed.

MATERIAL

As in the studies made in 1921-1925 and 1935-1936, the data collected in 1939-1940 relate to white children only. The elementary schools (both public and private), the junior high schools, and the senior high school were covered. Because of the inclusion of the senior high school and the local Catholic school, the sample of children surveyed in 1939-1940 was larger than in any other previous single year and the average age was higher. The figures showing full-time school years' of exposure for 1921-1925, 1935-1936, and 1939-1940 are presented in Table 6. The number of children included in each of the periods is as follows:

Age	1921-1925	1935-1936	1939-1940
6-7	2,796	742	1,151
8-9	3,686	1,109	1,129
10-11	3,354	1,171	1,145
12-13	2,681	1,216	1,260
14 and Over	2,989	793	2,075
All Ages	15,506	5,031	6,760

The mean age of the children of the 1939-1940 survey was 11.7 years; of those surveyed during 1935-1936, 10.7; while for the 1921-1925 period the mean age was 10.0 years. Thus, the children included in the 1939-1940 study were on the average about two years older than those of the first investigation. This difference must be taken into consideration when the comparison of morbidity between the groups is made, since it is a well-established fact that on the whole and for the majority of causes, the morbidity of children decreases with advancing years within the age span of this sample.

AGE (IN YEARS)	CASE RATE PER 1,000 CHILDREN PER SCHOLASTIC YEAR (ALL CAUSES)			RATIO	
	1921-1925	1935-1936	1939-1940	1935-1936	1939-1940
				100	100
6-7	2,662.5 ¹	3,135.4	4,244.5	118	159
8-9	2,590.5 ¹	2,814.7	3,682.9	109	142
10-11	2,167.5 ¹	2,325.8	3,158.5	103	139
12-13	2,370.1 ¹	2,515.3	2,823.9	106	119
14 and Over	2,111.8 ¹	2,940.4	2,919.5	132	132
ALL AGES	2,412.3	2,694.0	3,296.4	112	137

¹ Excepting twelve cases of mumps about which no information as to age is available.

Table 1. Absences due to sickness in Hagerstown, Maryland, white school children according to age, 1921-1925 (Collins), 1935-1936, 1939-1940.

SICKNESS CASE RATES IN 1921-1925, 1935-1936, AND 1939-1940

The relative frequency with which the children were absent allegedly because of sickness in the three periods examined is presented in Table 1. The statistical constant used to measure the relative frequency is the case rate per 1,000 children per school year of 180 days. The computation of this constant has been described by Collins (*loc. cit.*) and is based on the formula:

$$\frac{\text{Cases of absence from sickness} \times 1,000 \times 180^8}{\text{Children} - \text{days of school}}$$

From Table 1 the following points seem worthy of special note:

1. Taking all ages together the sickness case rate increased by 12 per cent between 1921-1925 and 1935-1936 and by 37 per cent between 1921-1925 and 1939-1940.
2. The increase between 1921-1925 and 1935-1936 is highest for the age group 14 years and over, but before 14 years it is highest in the youngest age group and seems to lessen with advancing age.
3. The increase between 1921-1925 and 1939-1940 is greatest for the

⁸ This formula derives from:

$$\frac{\text{Cases} \times 1,000}{\text{Full-time school years exposure to risk}} = \frac{\text{Cases} \times 1,000}{\frac{\text{Children days}}{180}}$$

youngest age and lessens with advancing age until the age group 14 years and over is reached when it again becomes high.

4. For all age groups except the oldest the case rate has increased between 1935-1936 and 1939-1940. For the age group 14 years and over the sickness case rates of 1935-1936 and 1939-1940 show little difference. It should be recalled that in 1939-1940 the age group 14 and over contained more older children than in 1935-1936.

Thus it would appear that since 1921 there has been an increase in the relative number of school absences caused by sickness. This trend is most striking for the younger children but is evident at all ages. Since the procedure of collecting the data was altered in the current survey it might be suspected that the increase in the sickness case rate resulted from this change. However, in the 1935-1936 survey the original procedure was carried out and the 1935-1936 results fit into the picture of an increasing trend of the sickness case rate. If the increase observed cannot be attributed entirely to alterations in the method of collecting information, then further study is necessary in order to determine how and why it occurred, particularly since on its face the increase would seem contrary to expectations.

DURATION OF ABSENCES IN 1923-1925 AND 1939-1940

During the school year 1939-1940 the number of school days lost per 100 children per school year of 180 days was found to be 1,220. Of this number, 824 days, or 68 per cent, were days lost because of sickness. According to Collins, during 1923-1925 (the only other period for which this information is available) 1,295 school days per 100 children were lost and of them 738 days, or 57 per cent, were due to sickness. Therefore, the total days lost did not change very much in the two periods compared, although the absenteeism due to sickness increased from 57 per cent in 1923-1925 to 68 per cent in 1939-1940.

For the separate age groups the relative number of school days lost from sickness and from other causes is shown in Table 2 where

AGE (IN YEARS)	SCHOOL DAYS LOST PER 100 CHILDREN PER SCHOOL YEAR					
	SICKNESS		OTHER CAUSES		ALL CAUSES	
	1923-1925	1939-1940	1923-1925	1939-1940	1923-1925	1939-1940
6-7	1,068	1,260	473	337	1,541	1,597
8-9	789	893	499	291	1,288	1,184
10-11	627	721	504	362	1,131	1,083
12-13	610	738	681	422	1,291	1,160
14 and Over	523	655	627	493	1,150	1,148
ALL AGES	738	824	557	396	1,295	1,220

Table 2. Days of absence from sickness and from other causes in Hagerstown, Maryland, white school children, in 1923-1925 and 1939-1940.

the comparison can be made between 1939-1940 and 1923-1925. The figures for 1923-1925 have been calculated from the data given by Collins. Table 2 reveals that between 1923-1925 and 1939-1940 the days lost from sickness have increased for all ages while the days lost from causes other than sickness have decreased. For neither of the two groups of causes is there noted a regular age trend in the increment or decrement between the two periods compared. Moreover, and this is important to keep in mind, there is no apparent consilience between the amount of increment relative to days lost from sickness and the corresponding amount of decrement relative to days lost from other causes. The age group in which the increment is a maximum is not the same as that in which the decrement is a maximum, and vice versa. This finding is to be considered especially in relation to the inference which might be drawn from the finding that total relative number of days of absence has remained practically constant in the periods covered. Because of this it might be inferred that the increase in days absent from sickness is only a consequence of designating in 1939-1940 as due to sickness absences which in 1923-1925 were attributed to other causes. However, it would then be expected that the ages showing the greatest increase in the days lost from sickness would also exhibit the greatest decrease in the days lost from other causes. As already mentioned,

this is not so. How might such an interchange of causes occur? In 1923-1925 the children absent from sickness may have hidden this fact, or in 1939-1940 the children absent from unlawful causes

Table 3. Average number of days absent per case of sickness in 1921-1925 and 1939-1940, Hagerstown, Maryland, white school children.

Age (in Years)	Average Number of Days	
	1921-1925	1939-1940
6-7	4.2	3.0
8-9	3.2	2.4
10-11	2.7	2.3
12-13	2.5	2.6
14 and Over	2.3	2.2
ALL AGES	3.0	2.5

may have attempted to avoid the sanctions involved by claiming sickness. The first assumption obviously cannot be accepted. The second might be acceptable except that the children knew that home visits were made by a representative of this office.

Moreover, when the average days lost per case of sickness is calculated it is found (see Table 3) that although the average was higher in 1921-1925 than in 1939-1940 for all ages combined, the difference is most apparent in the two youngest age groups. For the 6-7 year age group the average duration of absence per case is 1.2 days longer in 1921-1925 than in 1939-1940. For the 8-9 year age group the difference between the two periods is about 0.8 day; for the 10-11 year age group it is less than one-half day, but for the succeeding age groups there is only a slight difference. This finding would indicate that, especially in the younger ages, the severity of the illness causing school absences has diminished. The increased case rate noted would thus be accompanied by a change in the pattern of absenteeism caused by sickness, *viz.*, by an augmented preponderance of absences due to minor illnesses of short duration. Support for this inference is found in the following sections.

STATED CAUSES OF ABSENCE FROM SICKNESS IN 1921-1925, 1935-1936, AND 1939-1940

The case rates of the several diseases or illnesses alleged to be the

STATED CAUSE	RATE PER 1,000 CHILDREN PER SCHOOL YEAR						
	1921- 1922	1922- 1923	1923- 1924	1924- 1925	1921- 1925	1935- 1936	1939- 1940
ALL CAUSES	2,113.8	2,438.1	2,522.6	2,456.9	2,412.3	2,694.0	3,296.4
Colds	746.1	743.0	756.7	642.6	727.3	1031.8	1251.7
Influenza and Grippe	100.1	189.1	50.0	67.2	110.0	60.9	138.1
Tonsillitis and Sore Throat	241.8	221.2	255.0	213.9	232.8	243.2	283.6
Bronchitis and Cough	15.7	9.5	9.6	5.0	9.7	17.3	37.0
Pneumonia	7.7	4.3	4.0	2.7	4.4	2.4	3.3
Croup	17.4	16.4	10.3	17.4	15.0	17.6	16.0
Other Respiratory Diseases	3.2	5.8	5.8	3.7	5.0	10.4	11.7
Tonsil and Adenoid Operations	11.7	6.6	6.3	7.7	7.6	6.4	4.3
Measles	63.8	47.6	2.6	80.9	44.0	1.3	2.0
Mumps	0.8	1.4	0.7	277.4	56.4	2.4	0
Whooping Cough	41.6	0.4	14.7	6.7	12.6	17.1	8.2
Chickenpox	11.3	14.3	19.2	33.4	19.0	9.3	26.0
Scarlet Fever	2.0	5.0	3.5	3.7	3.8	8.9	10.0
Diphtheria	2.0	4.8	5.8	1.3	4.0	0.2	5.9
Digestive Diseases	218.8	244.0	270.4	201.2	238.8	305.9	456.0
Toothache	82.8	118.9	125.3	129.7	116.9	137.8	173.2
Other Conditions of Teeth	5.7	10.1	15.7	14.0	11.7	34.7	45.1
Earache	37.1	44.7	43.9	45.9	43.3	63.1	83.1
Other Ear Conditions	6.5	8.1	11.7	10.7	9.4	14.0	12.7
Diseases of Eyes	58.1	35.2	31.5	26.1	36.1	46.0	31.8
Headache	224.1	317.8	355.9	242.9	298.2	199.9	324.9
Scabies	6.9	1.5	4.2	6.7	4.2	5.1	0.8
Pediculosis	7.7	3.9	5.6	19.4	8.1	4.2	12.0
Bills	11.7	14.1	11.9	8.0	11.9	11.8	8.9
Other Skin Conditions	3.6	18.8	15.0	19.7	15.3	33.3	30.5
Accidents	21.0	40.2	45.1	42.1	38.8	61.4	72.3
Sore Hand, Foot, etc.	23.8	48.9	57.7	42.4	46.0	37.3	54.6
Menstruation	16.1	17.2	17.1	2.0	13.9	24.5	44.1
Neuralgia and Neuritis	9.7	6.4	6.8	2.0	6.2	2.0	2.6
Rheumatism	8.5	6.2	11.7	6.0	8.1	6.2	4.9
Stiff Neck	4.8	5.2	6.8	5.0	5.6	4.0	5.8
Cervical Adenitis	2.8	3.9	4.2	15.7	6.2	9.6	6.3
Heart Conditions	2.0	4.4	5.4	3.7	4.2	8.7	4.9
Unknown Diagnosis	48.0	169.2	267.1	210.2	185.4	177.4	35
All Other Diseases and Conditions	48.8	50.3	65.4	40.8	52.5	75.4	120.7

Table 4. Sickness allegedly causing absence from school, Hagerstown, Maryland, white school children.

cause of absence are presented in Table 4 for the single school years from 1921-1922 to 1924-1925, for the combined years 1921-1925, and for the years 1935-1936 and 1939-1940. The classification of illnesses adopted by Collins has been followed.

The data reported in Table 4 throw considerable light on the increase observed in 1935-1936 and 1939-1940 with respect to the 1921-

1925 period. In the first place it is seen that from 1921-1925 to 1939-1940 the increase was not manifest for all conditions nor was it present at all times for both 1935-1936 and 1939-1940. A systematic examination of Table 4 reveals that, compared to 1921-1925:

1. The case rates were progressively higher in 1935-1936 and 1939-1940 for colds, tonsillitis and sore throat, bronchitis and cough, croup, other respiratory disorders, scarlet fever, digestive disorders, toothache and other conditions of the teeth, other skin diseases, accidents, menstruation, cervical adenitis, heart conditions, and all other conditions.
2. The increase was observed for only 1935-1936 or 1939-1940 with respect to influenza and grippe; chickenpox; whooping cough; diphtheria; disorders of the eyes; headaches; scabies; pediculosis; sore hand, foot, etc.; and stiff neck.
3. The rate decreased in both 1935-1936 and 1939-1940 for pneumonia, tonsil and adenoid operations, measles, mumps, boils, neuralgia and neuritis, rheumatism, and unknown conditions.

It is essential to realize that the data for 1935-1936 and 1939-1940 represent information on single years separated by an interval of four years. Therefore, the rates for 1935-1936 and 1939-1940 could represent the results of unusual years, the peak or trough of cycles. In order to take into some consideration such annual fluctuations and to arrive at an estimate of the diseases which definitely increased or decreased beyond the range of the annual fluctuations observed, the rates for 1935-1936 and 1939-1940 will be examined in relation to the annual rates found from 1921-1922 to 1924-1925.

With reference to the conditions placed in group 1 above, Table 4 further shows that the rates for tonsillitis and sore throat, croup, and cervical adenitis are in 1935-1936 and 1939-1940 within the limits of the annual rates from 1921-1922 to 1924-1925. Only in 1935-1936 is the rate for heart conditions somewhat higher than in other years.

With regard to diseases and disorders placed in group 2, the majority have rates that in 1935-1936 and 1939-1940 fall within the ex-

tremes observed from 1921-1922 to 1924-1925. The exceptions are diphtheria, headaches, and stiff neck, which in 1935-1936 are below the lowest rates found before; and scabies, which in 1939-1940 is much lower than previously.

Among the conditions listed in group 3, boils and neuralgia and neuritis remain within the limits of the 1921-1922 to 1924-1925 fluctuations. Only in 1935-1936 is pneumonia below such limits and only in 1939-1940 is this noted for tonsil and adenoid operations, mumps, rheumatism, and unknown causes.

So it appears that in both 1935-1936 and 1939-1940 a marked increase took place in the rates for colds, bronchitis and cough, other respiratory conditions, scarlet fever, digestive disorders, toothache and other conditions of the teeth, earache and other ear conditions, other skin disorders, accidents, and menstruation. In both of these years there seems to have been a definite decrease in measles. In 1935-1936 only the rate for heart conditions exhibited an upward spurt, while the rates for pneumonia, diphtheria, headache, and stiff neck decreased. In 1939-1940 only is there an apparently definite decrease in the rates of tonsil and adenoid operations, mumps, rheumatism, scabies, and unknown causes.

This apparent change in pattern of the sicknesses causing school absences cannot be discussed fully before considering the effects of the differences in age composition of the samples considered. However, it is to be remarked that the rates for toothache, earache, and accidents exhibit an orderly increase from 1921 to 1940. In contrast, the decrease in measles and, to a lesser degree, in mumps may be regarded as the manifestations of the trough in the cyclical occurrences of epidemics of these diseases. The 1939-1940 deviation in the diphtheria rate from its expected decline was caused by a small epidemic in one school among uninoculated children. The marked decline in the 1939-1940 rate for unknown causes reflects the recent modification in the procedure of collecting the data.

Considering altogether the secular changes, the most significant

point to be noted in relation to morbidity and absenteeism is that on the whole there has been no change; in some instances there has been a decrease in the prevalence of diseases that are more important either from the standpoint of fatality in this age period or in terms of length of absence. The increase from 1921-1925 is observed especially in the two most frequent and less important causes of absenteeism, colds and digestive disorders. Together these two conditions in 1921-1925 constituted 43 per cent of the known causes of absence, in 1939-1940 they constituted 55 per cent. As a matter of fact, if there had been no change in the case rate from these conditions between 1921-1925 and 1939-1940 the total case rate would not have altered at all. The bearing that these and the other minor conditions have on the increase in the total case rate from sickness is illustrated in Figure 2.

In Figure 2 the diseases or conditions have been placed from left to right in decreasing order of their importance as measured by the average number of days of absence from each cause [*cf.* Collins (6)]. The case rates are summated proceeding from left to right. For the summation of the first five causes little difference is evident among the three periods. When the rate for measles is added, the 1921-1925 rate is higher than the others and remains so until the rate for accidents is introduced, when the 1939-1940 summated rate becomes the highest. But not until the rate for colds, the eighth from the last cause, is added do the 1939-1940 and 1935-1936 summated rates both rise above that of 1921-1925. As had already been deduced from the consideration of the duration of absences and case rate, this comparison indicates that the main change in pattern from 1921-1925 to 1939-1940 has been towards an increase in the relative frequency of absences from the minor sicknesses which are also the most common in this age period, while the prevalence of absences caused by major illnesses have remained the same or have decreased.

SEX PATTERN IN ABSENTEEISM FROM SICKNESS

The sex composition of the samples of children examined in

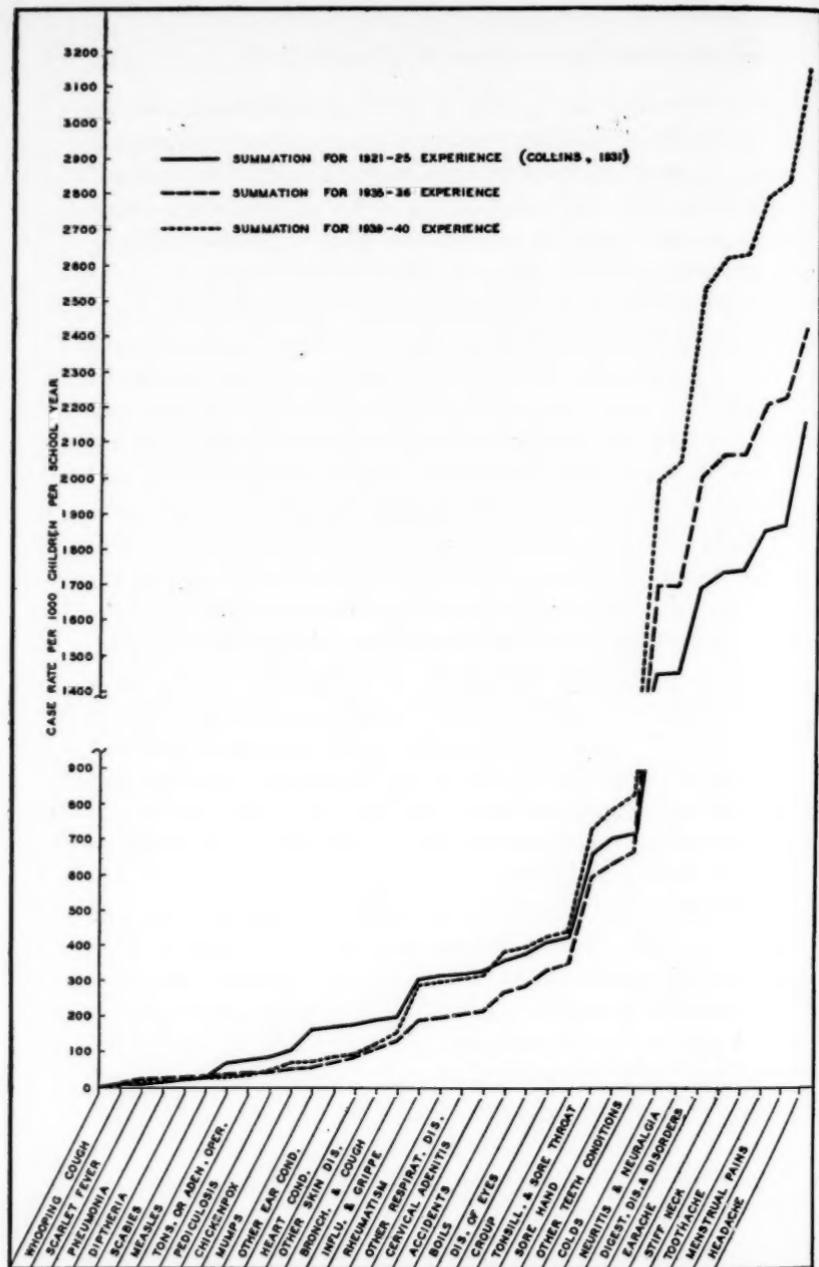


Fig. 2. Summation of case rates of sickness causing absences summated according to order of severity of sickness as measured by days absent per cause.

1935-1936 and 1939-1940, respectively, is practically the same as those surveyed in 1921-1925. What differences exist in the sickness case rates cannot, therefore, be accounted for by sex differences. In the last two surveys it has also been found that the sickness rate of girls is higher than that of boys. This is one aspect of a phenomenon which has long been noted (2), that is, that morbidity is higher in females but mortality is higher in males. The practical significance of this has been generally overlooked and cannot be discussed here.

Table 5. Ratio of sickness case rate of girls to that of boys, 1921-1925, 1935-1936, 1939-1940.

STATED CAUSE	100 RATE FOR GIRLS/RATE FOR BOYS		
	1921-1925	1935-1936	1939-1940
Pediculosis	347	406	835
Other Respiratory Diseases	191	171	94
Neuralgia and Neuritis	176	135	308
Cervical Adenitis	176	180	102
Other Ear Conditions	140	110	162
Bronchitis and Cough	135	118	93
Tonsillitis and Sore Throat	131	129	155
Diphtheria	126	—	129
Influenza and Grippe	122	153	133
Headache	117	100	98
Diseases of the Eyes	112	113	113
Other Tooth Conditions	112	91	94
Rheumatism	110	68	90
Earache	108	120	117
Digestive Disorders	107	103	111
Stiff Neck	106	131	41
Scarlet Fever	103	105	148
Colds	99	128	120
Toothache	97	94	112
Measles	97	200	208
Mumps	96	188	—
Other Skin Conditions	93	81	104
Tonsils and Adenoids	88	113	139
Chickenpox	79	135	111
Whooping Cough	73	265	80
Sore Hand, Foot, etc.	71	63	99
Pneumonia	68	60	128
Heart	66	41	175
Accidents	58	56	70
Boils	55	64	48
Scabies	53	115	167

but, it is hoped, will receive an extended study shortly. The sex ratios relative to the several diseases and disorders considered are presented in Table 5. This ratio is computed by the method of Collins: Ratio of rate for girls to rate for boys (boys = 100).

In Table 5 the causes of sickness have been arranged in decreasing value of the sex ratio found in 1921-1925. When the ratios of the three surveys are compared it is found:

1. In all periods the girls have a higher case rate of pediculosis, cervical adenitis, earache and other ear conditions, tonsillitis and sore throat, diphtheria, influenza and grippe, neuralgia and neuritis, diseases and disorders of the eyes, digestive disorders, and scarlet fever.
2. In all the years of the survey the boys have had higher rates for sore hand, foot, etc.; accidents; and boils.

The consistency of the direction of the sex differences relative to these conditions is interesting. Of course, the higher rates for boys with reference to sore hand, foot, etc.; accidents; and boils could be accounted for by the greater exposure to risk on the part of boys as compared to girls. At the same time the low rate for boys for pediculosis is probably associated with the sex differences in hair dress. However, for the other conditions mentioned no convenient explanation of the prevalence in one sex over the other is known. The problem of sex differences, which, if solved, would throw considerable light on a number of public-health questions, deserves more attention than can be given here. A new approach to such a problem has been formulated and it is hoped that a more definitive contribution can be made in the near future.

The changes in the direction of the sex ratio indicated in Table 5 in relation to the changes in case rate may be summarized as follows:

1. With reference to the conditions for which the case rate increased from 1921-1925 to 1935-1936, the increase was greater in the boys for bronchitis and cough, tonsillitis and sore throat, other respiratory conditions, toothache and other diseases of the teeth, other ear conditions,

digestive disorders, other skin diseases, heart conditions, and accidents. The increase was greater in the girls for cervical adenitis, diseases of the eyes, earache, colds, scarlet fever, whooping cough, and scabies.

2. With regard to the conditions for which the case rate increased from 1921-1925 to 1939-1940, the increase was greater in the boys for bronchitis and cough, other respiratory, other teeth, cervical adenitis, and stiff neck. The increase was greater in the girls for colds; tonsillitis and sore throat; influenza and grippé; earache and other ear conditions; toothache; diphtheria; scarlet fever; chickenpox; digestive disorders; pediculosis and other skin diseases; heart conditions; sore hand, foot, etc.; and accidents.

3. For the conditions showing a decrease between 1921-1925 and 1935-1936 the decrease was greater in the boys for pediculosis, influenza and grippé, stiff neck, measles, tonsil and adenoid operations, chickenpox, and boils. The decrease was greater in the girls for neuralgia and neuritis; headache; rheumatism; sore hand, foot, etc.; and pneumonia.

4. When the case rate between 1921-1925 and 1939-1940 diminished, it was associated with a greater decrease in the male rate for diseases of the eyes, measles, tonsil and adenoid operations, whooping cough, neuralgia and neuritis, pneumonia, and scabies; and a greater decrease in the female rate for rheumatism and boils.

The most interesting aspect of these findings is that the increase observed between 1921-1925 and 1939-1940 is in the majority of conditions associated with an increase in the sex ratio. That is, the girls have contributed more to the increase than the boys. The end result, taking all causes together, is that for the children 6-7 years of age the sickness case rate increased by 87 per cent for the girls and 43 per cent for the boys. In the next age group the increment equalled 69 per cent for the girls and 27 per cent for the boys. In the following age group the percentage increase was 48 and 39, respectively. In the 12-13 age group the increase for the girls was 27 per cent and for the boys 14 per cent. The trend is reversed in the case of the oldest age group where the increment is higher in the boys (47 per cent) than in the girls (22 per cent).

Table 6. Sickness (exclusive of mumps) causing absences, by age and sex, Hagerstown, Maryland, school children, 1921-1925 (from Collins, 1931), 1935-1936, 1939-1940.

STATED CAUSE	CASE RATE PER 1,000 CHILDREN PER SCHOOL YEAR												
	Boys						Girls						
	Year	All Ages	6-7	8-9	10-11	12-13	14+	All Ages	6-7	8-9	10-11	12-13	14+
Colds	1921-25	730.4	970.8	829.8	583.5	580.5	603.0	724.2	1015.4	858.9	607.1	584.4	577.2
	1935-36	908.7	1473.9	980.2	666.8	796.3	837.8	1161.9	1595.8	1665.5	948.2	806.1	854.2
	1939-40	1140.8	1383.1	1215.8	1047.4	926.7	1150.7	1365.6	2067.3	1591.2	1212.0	981.9	1173.9
Influenza and Grippe	1921-25	98.9	88.0	97.0	91.6	81.9	130.3	120.9	91.8	105.7	116.4	133.6	149.5
	1935-36	48.4	70.0	52.0	46.2	42.3	37.4	74.1	33.2	86.4	71.0	77.8	97.9
	1939-40	118.6	129.9	91.2	89.5	126.3	140.1	158.2	152.4	137.4	162.7	152.4	173.0
Tonsillitis and Sore Throat	1921-25	201.4	167.6	238.7	221.0	224.1	139.3	263.8	182.8	261.5	328.4	273.4	269.3
	1935-36	212.8	127.9	162.0	158.8	264.3	354.8	275.4	162.0	239.1	272.6	303.9	415.3
	1939-40	222.8	208.2	180.5	212.5	235.5	253.8	346.1	326.3	353.8	321.3	311.9	387.3
Bronchitis and Cough	1921-25	8.2	19.0	8.7	6.4	2.5	4.9	11.1	22.2	7.2	8.4	7.8	9.0
	1935-36	16.0	45.7	16.0	5.5	17.6	2.7	18.8	51.3	24.1	9.6	7.4	10.1
	1939-40	38.3	89.8	43.7	26.1	27.3	19.9	35.7	84.0	58.6	17.9	12.4	20.6
Pneumonia	1921-25	5.3	15.2	4.1	1.9	2.5	2.4	3.6	8.7	4.2	2.6	—	2.8
	1935-36	3.0	9.1	4.0	1.8	1.8	—	1.8	—	6.0	1.9	—	—
	1939-40	2.9	1.9	5.7	3.7	1.7	2.2	3.7	11.7	4.0	2.0	1.8	1.1
Croup	1921-25	17.1	42.5	26.1	10.2	5.9	0.8	12.0	29.3	25.4	7.1	2.3	1.4
	1935-36	17.7	21.3	28.0	20.3	5.3	16.0	17.4	39.2	20.1	21.1	3.7	6.8
	1939-40	17.2	43.9	28.5	14.9	6.8	3.3	14.7	43.0	18.2	9.9	12.4	1.1
Other Respiratory Diseases	1921-25	3.4	6.1	2.3	0.6	5.0	4.1	6.5	10.3	7.2	1.3	9.4	5.5
	1935-36	7.8	3.0	12.0	1.8	17.6	—	13.3	15.1	8.0	32.6	5.6	—
	1939-40	12.0	7.6	15.2	16.8	15.4	7.7	11.3	13.7	26.3	7.9	3.5	8.7
Tonsil and Adenoid Operations	1921-25	8.1	12.9	12.8	7.7	3.3	2.4	7.1	15.0	7.9	7.1	3.1	0.7
	1935-36	6.1	6.1	16.0	3.7	1.8	2.7	6.9	12.1	8.0	7.7	3.7	3.4
	1939-40	3.6	—	5.7	5.6	5.1	2.2	5.0	15.6	6.1	2.0	—	3.3
Measles	1921-25	44.8	150.2	51.1	16.7	5.0	4.9	43.3	142.5	59.8	17.5	7.8	2.1
	1935-36	0.9	—	4.0	—	—	—	1.8	3.0	4.0	1.9	—	—
	1939-40	1.3	1.9	—	—	—	2.2	2.7	2.0	6.1	4.0	—	2.1
Whooping Cough	1921-25	14.6	49.3	16.8	3.8	1.7	1.6	10.7	37.2	15.1	3.9	1.6	—
	1935-36	9.5	36.5	12.0	3.7	1.8	2.7	25.2	84.5	36.2	13.4	3.7	—
	1939-40	9.1	42.0	3.8	1.9	3.4	1.1	7.3	35.2	—	2.0	3.5	1.1
Chickenpox	1921-25	21.3	66.0	26.1	8.3	4.2	0.8	16.8	56.2	22.3	7.1	3.9	—
	1935-36	7.8	33.5	8.0	1.8	—	—	10.5	36.2	14.1	3.8	1.9	3.4
	1939-40	24.7	103.2	24.7	11.2	1.7	2.2	27.4	121.1	32.4	6.0	1.8	—
Scarlet Fever	1921-25	3.8	8.3	7.0	1.9	1.7	—	3.9	8.7	6.0	2.6	0.8	1.4
	1935-36	8.7	18.3	14.0	3.7	3.5	8.0	9.1	9.0	14.1	7.7	11.1	—
	1939-40	8.1	11.5	11.4	5.6	6.8	5.5	12.0	27.4	12.1	13.9	12.4	2.1
Diphtheria	1921-25	3.5	6.1	4.1	1.3	4.2	2.4	4.4	8.7	7.2	2.2	2.3	0.7
	1935-36	0	—	—	—	—	—	0.5	—	—	—	1.9	—
	1939-40	5.2	3.8	5.7	9.3	6.8	2.2	6.7	13.7	8.1	7.9	1.8	4.3
Digestive Diseases	1921-25	230.4	215.4	246.2	202.4	291.8	217.4	247.0	214.5	272.4	250.8	235.9	251.0
	1935-36	301.5	456.8	236.1	266.0	303.0	301.5	310.6	377.1	295.3	312.9	266.5	283.6
	1939-40	432.7	536.8	488.2	397.0	399.4	382.8	479.9	699.5	684.3	501.9	439.5	261.5
Toothache	1921-25	118.5	82.7	130.1	129.4	123.7	114.0	115.3	91.8	151.6	118.3	125.0	92.0
	1935-36	142.3	134.0	130.0	112.7	149.8	197.4	133.1	81.4	128.6	145.9	140.8	162.1
	1939-40	163.7	202.5	178.6	205.0	124.6	133.5	182.9	222.8	309.4	226.1	131.2	100.9
Other Tooth Conditions	1921-25	11.1	3.8	15.1	11.5	14.2	8.1	12.4	8.7	10.9	14.9	13.3	14.5
	1935-36	36.3	12.2	18.0	46.2	21.1	90.7	32.9	—	42.2	36.5	37.1	40.5
	1939-40	40.4	42.0	41.8	39.1	35.8	62.9	43.7	43.0	36.4	41.7	40.8	51.0
Earache	1921-25	41.7	78.0	52.8	25.6	34.3	15.3	44.9	65.7	68.0	42.7	35.2	15.3
	1935-36	57.5	115.7	70.0	38.8	42.3	40.0	69.1	72.4	70.3	78.7	50.0	81.0
	1939-40	76.7	120.4	72.2	82.0	71.7	54.1	89.8	130.9	117.3	89.3	86.8	54.2

STATED

Diseases of Eyes

Headache

Scabies

Pediculosis

Boils

Other Skin

Accidents

Sore Hand

Foot, etc.

Rheumatism

Neuralgia

Neuritis

Cervical A

Stiff Neck

Heart Com

All Other P

Full Time

Years of

CASE RATE PER 1,000 CHILDREN PER SCHOOL YEAR

STATED CAUSE	CASE RATE PER 1,000 CHILDREN PER SCHOOL YEAR												
	Boys						Girls						
	Year	All Ages	6-7	8-9	10-11	12-13	14+	All Ages	6-7	8-9	10-11	12-13	14+
14+ Other Ear Conditions	1921-25	7.8	11.4	5.2	10.2	5.9	5.7	10.9	13.5	12.7	10.3	7.8	9.7
	1935-36	13.0	15.2	30.0	5.5	8.8	5.3	15.1	30.2	8.0	21.1	9.3	10.1
	1939-40	9.7	9.6	7.6	9.3	6.8	13.2	15.7	21.5	14.2	13.9	17.7	13.0
577.2 854.2 173.0 Diseases of the Eyes	1921-25	34.0	26.5	34.3	30.7	44.3	33.4	38.2	36.4	40.5	33.6	45.3	36.0
	1935-36	43.3	54.8	50.0	35.1	42.3	37.4	48.9	39.2	52.2	48.0	57.4	37.1
	1939-40	29.9	26.7	20.9	35.4	20.5	39.7	33.7	39.1	48.5	25.8	33.7	27.1
149.5 97.6 173.0 Headache	1921-25	274.4	174.4	253.8	301.0	401.3	262.2	321.6	181.2	296.6	338.8	385.2	389.0
	1935-36	199.8	121.8	132.0	171.8	244.9	330.8	199.9	129.7	156.7	197.7	229.8	300.5
	1939-40	327.4	332.4	309.7	367.1	322.6	314.4	322.4	349.8	452.9	416.6	304.8	196.4
269.3 415.3 387.3 Scabies	1921-25	5.5	6.1	7.5	6.4	5.9	0.8	2.9	7.9	3.0	1.9	0.8	1.4
	1935-36	4.8	6.1	2.0	5.5	5.3	5.3	5.5	—	10.0	9.6	3.7	—
	1939-40	0.6	1.9	—	1.9	—	—	1.0	—	2.0	2.0	1.8	—
9.0 10.1 20.6 Pediculosis	1921-25	3.6	4.6	4.6	5.1	2.5	0.8	12.5	15.8	15.1	14.9	17.2	1.4
	1935-36	1.7	—	—	1.8	3.5	2.7	6.9	3.0	12.1	5.8	7.4	3.4
	1939-40	2.6	7.6	5.7	—	1.7	—	21.7	41.0	58.0	19.8	5.3	2.2
1.3 — 1.1 Balls	1921-25	15.4	6.1	11.0	12.2	20.1	28.5	8.4	6.3	7.2	7.1	8.6	12.5
	1935-36	14.3	—	4.0	12.9	19.4	34.7	9.1	3.0	6.0	9.6	13.0	13.5
	1939-40	12.0	9.6	7.6	9.3	10.2	18.8	5.7	3.9	4.0	9.9	7.1	4.3
1.4 6.8 1.1 Other Skin Diseases	1921-25	15.9	14.4	22.1	14.1	20.1	9.0	14.8	16.6	27.8	14.9	10.9	3.5
	1935-36	36.8	27.4	32.0	40.6	38.8	42.7	29.7	27.1	28.1	32.6	29.6	30.4
	1939-40	29.9	38.2	26.6	24.2	44.4	21.0	31.0	43.0	60.7	29.8	19.5	16.3
5.5 8.7 — Accidents	1921-25	49.1	36.4	54.6	49.3	60.2	48.9	28.6	29.3	24.2	25.2	42.2	24.9
	1935-36	75.3	70.0	54.0	57.3	82.8	128.1	43.5	27.1	32.1	46.1	51.9	60.8
	1939-40	84.8	78.3	53.2	63.0	99.0	101.5	59.4	33.2	50.5	83.3	74.4	50.4
0.7 3.4 3.3 Sore Hand, Foot, etc.	1921-25	54.0	47.8	48.2	51.9	70.2	48.9	38.1	30.1	38.1	49.8	38.3	27.7
	1935-36	45.4	33.5	40.0	38.8	58.1	53.4	28.8	15.1	48.2	17.3	24.1	40.5
	1939-40	54.9	78.3	60.8	42.9	54.6	54.1	54.4	109.4	72.8	45.6	51.4	20.6
2.1 — 2.2 Menstruation	1921-25	—	—	—	—	—	—	27.7	—	—	—	18.8	123.2
	1935-36	—	—	—	—	—	—	50.3	—	—	17.3	76.0	202.6
	1939-40	—	—	—	—	—	—	89.4	—	—	6.0	136.5	204.0
1.1 — 1.1 Neuralgia and Neuritis	1921-25	4.5	—	3.9	3.8	10.9	7.3	7.9	0.8	4.2	1.3	13.3	20.1
	1935-36	1.7	—	2.0	1.8	1.8	2.7	2.3	—	—	—	5.6	6.8
	1939-40	1.3	3.8	—	—	—	2.2	4.0	2.0	—	—	7.1	7.6
3.4 — Rheumatism	1921-25	7.7	3.8	5.8	12.2	10.9	7.3	8.5	2.4	7.9	9.7	10.9	10.4
	1935-36	7.4	3.0	6.0	11.1	5.3	10.7	5.0	—	6.0	—	13.0	3.4
	1939-40	5.2	—	7.6	7.5	3.4	6.6	4.7	2.0	6.1	2.0	1.8	8.7
1.4 2.2 — Stiff Neck	1921-25	5.4	2.3	4.1	4.5	12.5	5.7	5.7	3.2	8.5	1.9	6.3	7.6
	1935-36	3.5	—	4.0	5.5	1.8	5.3	4.6	3.0	2.0	1.9	5.6	13.5
	1939-40	8.1	1.9	5.7	7.5	8.5	13.2	3.3	2.0	—	6.0	7.1	2.2
0.7 — 4.3 Cervical Adenitis	1921-25	4.5	3.8	7.5	3.8	2.5	2.4	7.9	7.9	10.3	12.9	5.5	2.1
	1935-36	6.9	6.1	2.0	12.9	7.0	5.3	12.4	—	12.1	28.8	11.1	—
	1939-40	6.2	5.7	11.4	5.1	4.4	6.3	11.7	4.0	4.0	4.0	10.6	3.3
151.9 83.6 61.5 Heart Conditions	1921-25	5.0	3.8	1.7	6.4	7.5	8.1	3.3	—	3.0	5.8	5.5	1.4
	1935-36	12.1	—	10.0	—	35.2	8.0	5.0	—	4.0	7.7	3.7	10.1
	1939-40	3.6	1.9	5.7	5.6	3.4	2.2	6.3	3.9	14.2	7.9	1.8	5.4
92.0 62.1 0.09 Unknown	1921-25	169.3	177.5	141.1	188.9	231.6	124.6	201.2	190.7	130.5	109.8	225.0	278.2
	1935-36	150.5	167.5	160.0	92.4	190.3	218.8	205.9	277.5	215.0	176.6	164.9	236.3
	1939-40	3.2	3.8	5.7	7.5	—	1.1	3.7	11.7	4.0	6.0	—	—
14.5 — 51.0 All Other Diseases	1921-25	42.8	52.3	42.4	41.0	45.2	36.6	62.1	66.5	58.6	55.6	64.1	67.1
	1935-36	65.3	33.5	40.0	96.0	56.4	96.0	86.0	39.2	78.4	109.4	100.1	84.4
	1939-40	98.1	124.2	104.5	96.9	95.6	81.6	143.8	179.8	165.8	162.7	108.1	123.7
15.2 81.0 81.0 Full Time School Years of Exposure	1921-25	7411.9	1318.5	1722.1	1561.3	1196.0	1228.0	7509.0	1263.6	1655.6	1546.8	1280.0	1444.8
	1935-36	2312.1	328.4	499.0	541.4	567.6	374.8	2186.0	337.5	497.7	521.0	530.6	206.2
	1939-40	3078.9	523.5	526.4	536.6	586.0	906.4	2996.7	511.8	494.6	504.0	564.3	921.8

AGE AND SICKNESS CASE RATE

In Table 6 are presented the case rates relative to the several diseases and disorders divided according to age and sex as observed in 1921-1925, 1935-1936, and 1939-1940. As already mentioned, the average age of the 1939-1940 sample is higher than that of the 1921-1925 children. However, as the data of the table indicate, this does not affect the increase in case rate.

With reference to the age pattern of the prevalence of the several causes, the rates shown in Table 6 are in general agreement with those observed in 1921-1925 by Collins. In the majority of cases, it appears that the rates are higher in the youngest children and decrease with age. This is noted for colds, croup, bronchitis and cough, pneumonia, whooping cough, and scabies. For a few causes, such as influenza and grippe, and boils, there seems to be a definite tendency toward an increase with advancing age. In others, such as digestive disorders, headaches, and toothaches, there is no definitive trend.

A detailed examination of Table 6 will reveal that the increase or decrease in rates from 1921-1925 to 1935-1936 and 1939-1940 is not remarkably associated with age. In general, and probably due to the relative smallness of some of the rates, it may be said that with respect to the age groups into which the population of children has been segregated the increase is irregular with no consistent trend in evidence. Among the twelve illnesses whose case rates appear to have increased significantly in 1935-1936 and 1939-1940, the increment is about the same at all ages for colds, other respiratory conditions, other conditions of the teeth, and other ear conditions. The increase is more marked in the older ages for scarlet fever, earaches, and other skin conditions; it is more distinct in the younger ages for digestive disorders and menstruation. For toothache the increase from 1921-1925 to 1935-1936 is greater in the older children but from 1921-1925 to 1939-1940 it is greater in the younger. With ref-

erence to bronchitis and cough, and accidents, the increase in the rate for boys is about the same at all ages but for the girls the increase of the former appears more at the younger ages while that of the latter seems to be higher among the older girls.

The incidence of measles and tonsil and adenoid operations has decreased essentially among the younger children. That the decrease in the measles case rate should affect the youngest ages is not surprising because of the age incidence of this disease. With regard to the decline in tonsil and adenoid operations the age pattern of the decline also conforms to expectation. However, the lowering of the frequency of this operation may not be real. It could be caused by operations being performed in preschool years or timed so that hospitalization would fall within the summer vacations. The increase in the case rate of menstruation is of particular interest. It will be observed that among the girls 14 years and over the increase in the rate is about 60 per cent between 1921-1925 and both 1935-1936 and 1939-1940. But among the girls 12-13 years old the rate in 1935-1936 is four times and in 1939-1940 is seven times that of 1921-1925. This finding need not indicate that menstrual pains are more common now among the young girls. In view of the greater precocity of growth, some evidence of which is shown by Wolff's (7) data on the same sample of children, the increased absence because of menstrual pain may be an indication of a more precocious puberty.

ATTENDANCE BY PHYSICIAN IN 1921-1925 AND 1939-1940

In Figure 3 the frequency with which in 1921-1925 and 1939-1940 a physician was called by the parents is compared for each cause of absence. On the whole, it is immediately seen that no remarkable change took place either in the percentage attendance or in the order of frequencies. As in 1921-1925, during the school year 1939-1940 a physician was always in attendance in the case of pneumonia, diphtheria, and tonsil and adenoid operations. In the latter year, the scarlet fever cases were also always attended by a physician. It

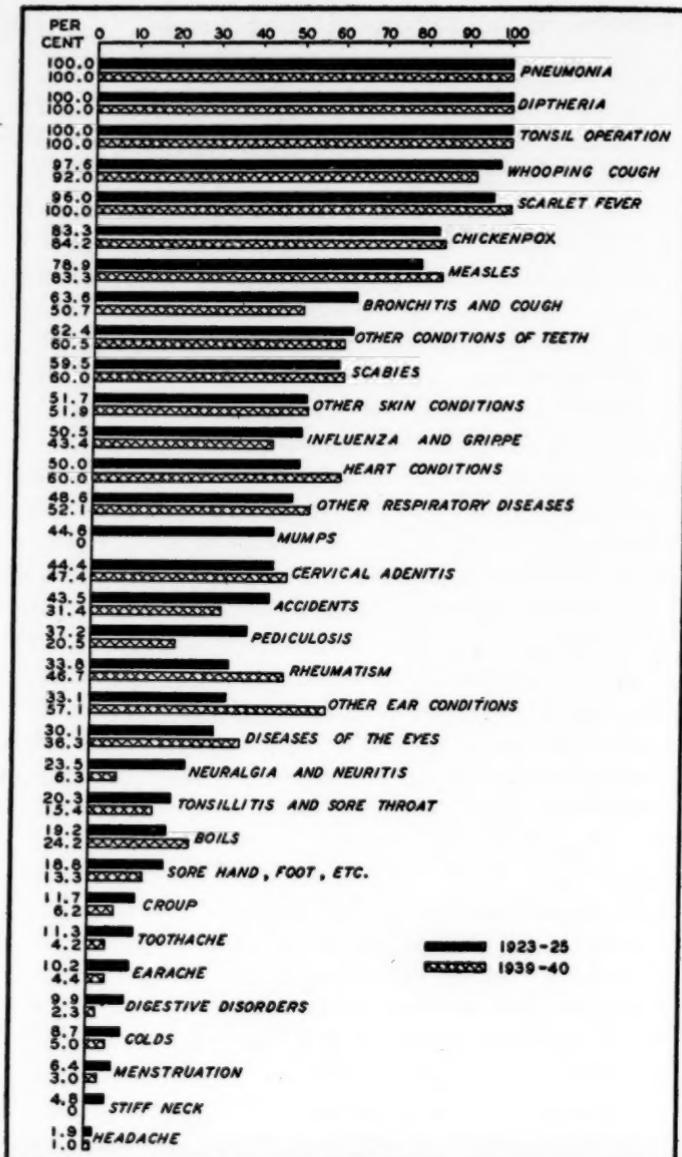


Fig. 3. Per cent cases attended by physicians.

will be observed that for the other so-called infectious diseases of children the percentage of cases presumably treated by a physician has not altered during the periods compared. When a decrease in the percentages has occurred it is associated with the minor conditions and particularly those that have become more prevalent. Thus, physicians were called to attend 8.7 per cent of the colds in 1921-1925 and only 5.0 per cent in 1939-1940, 9.9 per cent of the digestive disorders in 1921-1925 and only 2.3 per cent in 1939-1940. In addition to these conditions a marked decline in the percentage of cases attended by physicians is seen for neuralgia and neuritis; menstruation; sore hand, foot, etc.; stiff neck; and croup.

The augmented total morbidity case rate has not been accompanied by an increase in the total frequency with which medical attention has been obtained. As is obvious, this is caused by the sharp decline in the frequency with which physicians have attended cases of the most common causes of absenteeism due to sickness. No such decline is observed with reference to the major and more important diseases of childhood. Therefore so far as this sample of children is concerned, it does not seem that between the periods compared the desire or means of obtaining medical attention has been reduced. It appears more likely, in view of the characteristics of the increase in sickness case rate, that the findings relative to the attendance by physicians emphasize again that the sickness rate increment observed is associated essentially with an increase in conditions of such a mild nature that in the eyes of responsible persons, parents or guardians, the advice of a physician was not warranted.

DISCUSSION

The main findings which emerge from this comparison of the absenteeism due to sickness in 1939-1940 and 1935-1936 with that of 1921-1925 are:

1. The case rate is higher in the two latest surveys.
2. In general the increase in the case rate is more marked in younger

children and in girls and is accompanied by a reduction in the total relative number of cases attended by physicians.

3. The increase is on the whole limited to absences allegedly due to colds, bronchitis and cough, other respiratory diseases, scarlet fever, toothache, earache, digestive disorders, accidents, other skin diseases, and menstrual pains.

The increment in the case rate of these conditions, particularly for colds and digestive disorders, is of such magnitude that it cannot be balanced by the decrement in the rate of measles and it masks the fact that the level of the rates of all the other illnesses and diseases has not altered much during the time interval considered. Several general factors evidently contribute to the observed changes. The higher prevalence of accidents is not surprising and in the case of vehicular accidents reflects a serious situation. The increase is more marked in girls probably because the present mores permit more outdoor play to this sex. It may be that the current customs in dress are related to the increase in the spread of impetigo which forms the main disease included in the category "other skin diseases." On the other hand, the increase in the relative number of girls absent because of menstrual pains could probably be associated with the earlier onset of puberty which, according to a number of observers, characterizes the more recent generations. On this basis then, the higher rate of absences would be a consequence of the increase in the number of girls who were subject to menstrual pains.

It could be assumed, in view of the epidemiology of scarlet fever and measles, in particular, that the respective decrease and increase in case rate are fortuitous. The significant point about the increase in the prevalence of scarlet fever is that it has affected mostly the older children while the fatality from the disease was not increased.

The increase in the rate of toothache and earache seems to represent a trend evident since 1921. Since there is an increase in the rate of other conditions of the teeth and of the ears (including absences due to dental or otological treatment), the apparent trend

may have real significance worth investigating further. Whether this increase is associated with the increase in colds and other respiratory upsets cannot be determined at this stage.

The increase in the frequency of absences due to colds and to digestive disorders, the most common and indefinite indispositions, constitutes the bulk and the main feature of the higher sickness case rate. With respect to colds it is noted that there has been no corresponding increase in the absences due to the major forms of respiratory diseases: influenza and grippe and pneumonia. In view of this it may be doubted that the increase in absences from colds is the outcome of a greater incidence of this condition. For colds, and for digestive disorders also, a remarkable decline is observed in the relative number of cases attended by physicians. This finding, taken together with the apparent diminished severity of the illnesses as measured by duration of absence and the preponderance of the increase in the younger age groups, leads one to suspect that the higher sickness case rate as affected by the change in the absenteeism from these mild indispositions is probably not due to an increase in the prevalence of these conditions. That is, children with colds and digestive disorders are now more often absent but the number of colds and digestive upsets are more or less the same. If this inference is justified then the increase in the case rate of these conditions is essentially the result of greater care or precautions taken now by parents. In a sense this is to be expected if the health propaganda by private and public agencies regarding the need for early treatment of minor disorders has any effect. In other words, the more extensive education of the public concerning health would bring about a situation such as this in which children are absent more often from school for short periods of time and because of conditions that in a less enlightened era would not have been considered a legitimate cause of absence. The validity of this view will be examined in a subsequent report dealing with absenteeism in the socio-economic groups.

SUMMARY

This paper presents data on the absenteeism due to sickness among the white children of the schools of Hagerstown, Maryland, during 1939-1940, and the absenteeism observed in the same community during 1935-1936 and 1921-1925. Data for the 1921-1925 period are derived from the reports of S. D. Collins (*loc. cit.*).

The comparison reveals:

1. In 1935-1936 the sickness case rate from all causes increased by 12 per cent, and in 1939-1940 by 37 per cent over the rate recorded in 1921-1925.
2. On the whole, the increase in the total absence due to sickness has been greater for girls.
3. The higher case rate observed in recent years results primarily from a marked increase in the absenteeism allegedly due to colds and digestive disorders. In 1939-1940 the rate for the former was 72 per cent greater than in 1921-1925 and for the latter it was 91 per cent greater. In addition to these two causes it is noted that in 1935-1936 and 1939-1940 there was a slightly higher prevalence of absences associated with bronchitis and cough, scarlet fever, tooth-ache and other dental conditions, earache and other otological disturbances, other skin disorders (impetigo), accidents, and menstrual disturbances.
4. No definite change is observed in the case rates of absences due to influenza and grippe, pneumonia, croup, tonsillitis and sore throat, mumps, chickenpox, whooping cough, diphtheria, heart conditions, rheumatism, disorders of the eyes, headache, neuralgia and neuritis, soreness of the limbs, stiff neck, pediculosis, boils, and scabies.
5. In 1935-1936 and 1939-1940 the case rate of absences due to measles was lower than that in 1921-1925.
6. The number of days of absence due to sickness rose from 7.4 days per child in 1921-1925 to 8.2 in 1939-1940, but the average dura-

tion of absence per case of sickness fell slightly, from 3.0 to 2.5 days. This decrease is mainly among the younger children.

7. For the majority of illnesses causing absence the frequency with which a physician was in attendance remained the same in the periods compared. However, the percentage of cases attended by a physician fell from 8.7 per cent in 1921-1925 to 5.0 per cent in 1939-1940 for colds and from 9.9 per cent in 1921-1925 to 2.3 per cent in 1939-1940 for digestive disorders.

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THE ECONOMICS OF MASS EXAMINATION FOR TUBERCULOSIS¹

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DURING the past few years, there has been an increasing interest in case finding as a fundamental step in the control of tuberculosis. The tuberculosis problem has been of such extensive proportions for so many years in most communities that every available method has been utilized to reduce its spread, and if the costs of these efforts are measured against the estimated monetary losses caused by the disease, the expenditures seem very small indeed. Until recently, very little attention has been paid to the cost of a given procedure, and its yield in significant new cases.

There are only occasional references to costs in case finding in the literature and such as do exist are usually not accompanied by the basic items upon which they were computed. Thus, they are not comparable one with the other, and give no basis for the estimation of costs by others desirous of launching a program. As the majority of these programs are financed through tax funds, and as the amount of such funds available is limited, it is well that some basic data be set up that will serve as a guide.

Some workers ignore such items as rent, heat, light, or the salaries of personnel if they were not actually paid for in the specific survey. If the survey is conducted in a public building for which no rent is paid no charge is made. If the tuberculin tests are done by a staff paid for other services, or the radiographs interpreted in a like manner, no charge is made. While these differences represented by the non-expenditure of funds for specific items may in a sense be

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legitimate in estimating costs, they must, nevertheless, be considered if an accurate comparison is to be made between the programs operated under differing auspices.

The mass survey of apparently healthy adults in New York City has been fully outlined in a supplement to the *American Review of Tuberculosis* in June, 1940. It was therefore felt that the analysis of costs of this work for a specific period might help to lay a sound foundation for cost accounting in mass surveys.

This report will therefore deal with as complete a cost analysis as can be made of the mass surveys conducted by the Department of Health in New York City for the period from January 1 to June 30, 1940. During this period 24,136 individuals were radiographed in our surveys, representing individuals from twenty-nine different sources.

The studies in New York City have been done with a certain amount of assistance from the Work Projects Administration. During the period of this study, the contribution from Federal funds is represented entirely in clerical or statistical personnel. A total of twenty-five individuals were assigned to the surveys by Work Projects Administration. The Department of Health provided all the professional staff such as physicians, nurses, and also x-ray technicians, and some supervisory clerical assistance. The costs for materials and supplies (survey x-rays, cut films, tuberculin, stationery, etc.) are indirectly borne by the City of New York as they are taken from funds regularly allotted to WPA by the City to cover similar costs in all WPA Projects.

The rapid paper x-ray method was used on a contract basis. The vendor supplied the x-ray unit, the technicians to operate it, the paper film in rolls, and the technical services required in processing and its delivery to the Department ready for interpretation.

The cost of the radiographs on this plan were based on a sliding scale ranging from 75 cents each where 500 or more were done in a single day to \$1.00 where 200 or less were done in the same time.

Occasionally more than one unit was in operation on a given day, however, the above rates held.

The original survey radiographs were usually made in the quar-

Table 1. Cost of x-ray surveys of 24,136 individuals for the six-months period, January 1 to June 30, 1940.

TYPE OF EXPENDITURE	AMOUNT	PER CENT
ORIGINAL MASS SURVEY USING ROLL PAPER.....	\$19,251.75	45.45
Contract with vendor includes:		
Films	Typist	
Apparatus	Processing	
Technicians	Viewing Device	
PERSONNEL AND OTHER COSTS REQUIRED TO COMPLETE SURVEYS.....	23,102.15	54.55
PERSONNEL:		
Medical and Technical.....	\$8,102.06	
Supervision	1,144.96	
Phy. 600 Sessions	3,000.00	
Nurses	2,876.34	
Technicians Service	574.66	
Laboratory Sputum		
1,446 Sputum Examinations	506.10	
CLERICAL.....	12,033.34	
Supervision	850.50	
14 Clerks	7,077.18	
1 Stenographer	400.65	
2 Typists	945.61	
5 Research Editors	2,759.40	
SUPPLIES:		
Medical.....	947.03	
1,794 X-ray Films	773.21	
Chemicals	53.81	
Drugs and Sudries	120.00	
Clerical.....	125.00	
General	125.00	
OTHER EXPENSES.....	1,894.72	
Rental	1,350.00	
Telephone	90.00	
Electric Service	180.00	
Depreciation of Equipment	274.72	
TOTAL	\$42,353.90	100.00

ters of the agency cooperating in the survey. No charges have been made for the use of this space nor the time of the agency personnel in organizing their membership to appear before the machine for a radiograph.

The preliminary planning and organization of a given survey represents almost entirely an effort on the part of the cooperating agency. It has been our custom to outline the plan to the agency and leave the further details to them. The time utilized by the Department staff has been accounted for in the percentage of services devoted to the survey.

The interpretation of the survey film, the subsequent follow-up of the suspicious or definite cases to the point that a final diagnosis and recommendation could be made, and the tabulation and analysis of data were done in the Central Chest Clinic of the Department of Health. A summary of the costs involved from the beginning of the survey to the above-mentioned point is shown in Table 1.

TYPE OF EXPENDITURES

The original x-ray by the roll paper method accounted for 45.5 per cent of the total cost. On the basis of the expenditure for this item the average cost per film was 79.7 cents. This was due to the fact that it was impossible to x-ray a minimum of 500 individuals per working day. This is a real problem in mass survey work that must always be taken into consideration. Prior to the period included in this study, tentative plans had been made to x-ray a minimum of 50,000 individuals. These plans failed to materialize because in some surveys actually done a larger number of individuals was anticipated from estimates of the organization involved than actually were x-rayed, consequently the equipment was scheduled for a longer period than was necessary. In addition, the promises of a stated number per day did not materialize. There were also some surveys planned for the period that had to be cancelled due to change in plans or circumstances beyond our control.

PERSONNEL AND OTHER COSTS

Personnel and other costs constituted 54.5 per cent of the total. In computing these costs the material has been divided into certain groupings for clarity in analysis.

Under medical and technical supervision is included personnel and sputum examination. The item referring to supervision represents on a pro-rata basis the time devoted to the surveys by the Director of the Bureau and his supervisory staff. The physicians' time in interpreting survey films, examination, and final diagnosis of cases is indicated as 600 physicians' sessions which are compensated for at the rate of \$5.00 per session. The item for nurses' and technicians' services is pro-rated on the basis of their time actually spent on the surveys. It is to be remembered that the Central Chest Clinic where this work is done is also responsible for other services.

The Bureau of Laboratories estimate the cost of a sputum examination on the basis of personnel, materials, and a reasonable overhead for administration and capital investment. On this basis, which seems to be reasonable, the cost per examination at 35 cents is not excessive. All sputa examinations in the laboratory are done by the concentration method.

Clerical. The clerical costs represent full time of WPA personnel, which included an item for supervision inherent in WPA organization but which did not contribute to the actual work of the survey.

Supplies. X-ray films constitute the chief item in the cost of supplies. The cost of 14 x 17 celluloid films to the City of New York is 43.1 cents each as the entire supply for all city services is purchased on an annual contract. Each case requiring follow-up is radiographed on celluloid, using one or more as the individual case demands. The item for chemicals is estimated on the basis of three cents per film. This figure is derived on experience estimates of 25 films per gallon of chemicals at a net cost of 75 cents.

Under drugs and sundries are included tuberculin, syringes, alcohol, cotton, lipidol, etc. In the surveys reported in this study 1,927

high-school pupils were tuberculin tested prior to x-ray examination.

General clerical supplies represent items such as record forms, stationery, postage, and the like.

Other Expenses. The quarters used for the follow-through of the survey work are in a city-owned building for which no actual rent is paid. However, a charge has been made on the basis of rental values for equivalent space in this district of the City. Electric service is based on the actual cost for another location of similar size in which bills were available. The charge for telephone is the actual cost of equipment in this location, as it is an unlimited service no deductions were made for use in other activities.

The depreciation of equipment has been based on acceptable standards for such calculation including x-ray items, typewriters, calculators, adding machines, and miscellaneous equipment.

UNIT COSTS OF SURVEYS

A clinically significant case has been considered as the basic unit for estimating the cost of case finding. Such a case may be defined as one with radiographic evidence of a lesion characteristic of the reinfection type of pulmonary tuberculosis, varying from the obviously active, with associated constitutional symptoms and physical findings, to those without associated findings, but in which the stability of the lesion cannot be determined without further supervision. A distribution of these costs is shown in Table 2.

On the basis of costs charged against these surveys, the average cost for each individual examined was \$1.75. The unit cost for each case of chronic pulmonary tuberculosis (active and arrested) was \$58.99, and the cost for each clinically significant case was \$146.55.

The variations in unit costs bear a general relationship to the average age of the population studied. Thus the costs among high-school students, with an average age of 16.5 years, was over ten times as great as among the homeless, with an average age of 50.8 years.

The unit cost for all chronic tuberculosis is less than the unit cost for clinically significant cases, also with the increase in average age the ratio of significant to all chronic lesions becomes less.

The unit cost of significant tuberculosis was highest in students in evening high schools and those examined at settlement houses. A classification of racial stock, other than white and colored, was not made in these studies. However, from the areas from which they were drawn it is fair to assume that a high percentage were Jews among whom the tuberculosis rates are low. Further suggestive evidence of this general racial background is to be seen in the higher ratio of arrested tuberculosis.

The college students reported in the study were the positive reactors to tuberculin at Queens College. A total of 1,651 were tested by the College and 462, or 28.4 per cent, reacted and were x-rayed by us. The selection for x-ray by the tuberculin test reduced the cost by

Table 2. Classification of 24,136 individuals surveyed showing total cost per group and unit costs according to diagnosis.

CLASSIFICATION	NUMBER X-RAYED	AVERAGE AGE	NUMBER DIAGNOSIS CHRONIC PULMONARY TUBERCULOSIS		TOTAL AND UNIT COSTS		
			Active ¹	Active ¹ & Arrested	Total at \$1,7548 per Person	Chronic Pulmonary Tuberculosis	Active ¹
Day High Schools	8,929	16.5	31	36	\$15,668.61	\$505.44	\$435.24
Colleges	462	19.3	4	4	810.72	202.68	202.68
Evening High School	925	29.1	3	12	1,623.19	541.06	135.27
Settlement Houses	3,945	31.1	13	93	6,922.69	532.51	74.44
Civil Service Applicants	596	32.2	0	9	1,045.86	—	176.21
Union Members	3,912	35.1	36	137	6,864.78	190.69	50.11
Prisoners	3,260	38.1	123	222	5,720.65	46.51	25.77
Homeless	2,107	50.8	79	205	3,697.36	46.80	18.04

¹ Active = Clinically significant.

the difference between the cost of x-rays for the total and cost for the reactors. This saving is estimated roughly at \$891.75.

This difference is further illustrated in considering the students in high schools included in this study. Only a few were preselected with the tuberculin test, the majority being routinely x-rayed. The two groups are not exactly comparable in all respects. Students in Queens College are, by and large, residents of the Borough of Queens where the death rate from tuberculosis is very low when compared to the general areas of the City from which the high-school students were drawn. Thus, the percentage of reactors in Queens College of 28.4 per cent is considerably lower than other tuberculin studies among high schools similar to the above which average nearer 50 per cent.

A routine x-ray, regardless of reaction to tuberculin, has many advantages in survey work. It is much easier to secure cooperation for an x-ray than for a tuberculin test, and not infrequently non-tuberculous conditions are discovered in non-reactors that need attention. If the purpose of the survey is to secure information on epidemiological factors then the tuberculin test is essential; if the purpose is to discover manifest lesions then the x-ray is necessary. However, in case finding among the younger age groups with equipment now available an appreciable amount may be saved by preselecting the material on the basis of a positive reaction to tuberculin.

For several years a routine x-ray has been required of applicants for appointment to civil service positions in the Departments of Health and Education and the Fire Department. The 596 reported here were those examined during the first half of 1940. It has been noted that since the start of this program the percentage of disease has steadily decreased. This is due to the fact that an increasing number of these individuals are being x-rayed before applying for positions and thus significant cases are automatically eliminated before they come to Civil Service.

The percentage of significant tuberculosis in the members of unions examined in this study was 0.9 which compares favorably with other surveys of union workers involving 33,303 individuals, and in whom the prevalence of tuberculosis was 0.7 per hundred. In our experience in survey work, persons employed, such as members of unions, have a much lower percentage of tuberculosis than those on relief and the unemployed.

CONCLUSION

An attempt has been made to set up indices of cost that would be fairly constant for specified operations on the basis of this study, but it is not believed that the data thus far can be evaluated in that manner. It would be important to have such indices so that the cost of a survey of a given population could be fairly estimated in advance. Cost analyses such as the foregoing are being made for the year 1940, which will include 98,448 examinations, and it may be that a reasonable average will be obtained.

This study is presented as a preliminary report on cost accounting in mass surveys with the hope that it will stimulate others to report on other methods of survey, such, for example, as fluoroscopy and the fluorographic method using the 4 x 5 or 35 mm film, and surveys using standard sized celluloid or paper in stationary or portable apparatus.

If cost accounting is to be of any value, the analysis must include comparable items of expense regardless of whether or not they represent monies actually expended, or the equivalent of such costs as personnel, rent, and overhead items that have a monetary value.

ANNOTATIONS

CHEMISTRY OF FOOD AND NUTRITION¹

EVERYONE who has any interest in the subject of food chemistry is familiar with Dr. Sherman's books on the CHEMISTRY OF FOOD AND NUTRITION. Since the first edition was published in 1911, they have been universally accepted as a text by students of human nutrition. This is the sixth edition of the book. The same general plan for the presentation of subject matter is followed in this edition of CHEMISTRY OF FOOD AND NUTRITION as in preceding volumes. Familiar material comes first and is followed by that which is newer.

Chapter I, "General Introduction," gives a brief history of the research work since 1900 which has been responsible for the evolution of the "six pillar concepts" of our present-day study of nutrition. This historical outline indicates the pattern or chronological order in which material is presented throughout the book. Subject-matter of courses in General Organic Chemistry is not included.

Chapters II to VII inclusive, present the chemical nature, nutritive functions, digestion and metabolism of carbohydrates, fats, and proteins. Much of the material is necessarily a repetition of what appeared in earlier editions. It is familiar information, and there seems to be no need for further comment, except to mention Dr. Sherman's warning against allowing the newer findings of research to eclipse this longer-established knowledge.

The fuel-value of foods and human energy requirements under different conditions are the subjects of Chapters VIII-X. In Chapter VIII, practical working formulas are given for calculating the calorie-value of carbohydrates, fats, and proteins. Chapter IX shows how the basal energy requirements of the individual may be figured in terms of body surface

¹Sherman, Henry C.: CHEMISTRY OF FOOD AND NUTRITION. Sixth edition. New York, The Macmillan Company, 1941.

area; and Table 18 and Figure 21 give the surface area for individuals of stated height and weight according to Dr. E. F. Dubois' formula. The influence of carbohydrates, fats, and proteins on basal calorie requirements is discussed, and the actual specific-dynamic action of these food constituents is estimated numerically. Average energy losses in digestion are given. Chapter X takes up total energy requirements. Table 23 gives the energy expenditure per hour under different conditions of muscular activity as compiled by Dr. Rose. Energy requirements of pregnancy and lactation, and total energy requirements of children are discussed separately.

Protein requirements are discussed in Chapter XI. Maintenance levels of intake are compared with optimal amounts. Factors influencing the utilization of protein that are discussed in this chapter are: (a) the protein-sparing action of carbohydrates and fats; (b) nitrogen output on different levels of intake; (c) the nutritional efficiency of the protein mixtures contained in different foods; (d) the influence of muscular exercise; (e) protein requirement in relation to age and growth. Dr. Sherman suggests that more careful study should be made of protein in connection with pathological conditions, so that it will be possible to discriminate more exactly between normal and abnormal protein metabolism. Papers by Weech and by Weech and Goetsch have pointed out this need of further study.

Chapters XII through XVI are concerned with inorganic or mineral elements. The general functions of minerals in nutrition, sources of these elements, and requirements are discussed. Changes that appear in Chapter XIV of this sixth edition with reference to calcium and phosphorus requirements and content of typical foods are of especial interest. First among the changes is in minimum calcium requirement. Recent work by Leitch and Owen have raised the formerly accepted minimum calcium requirement of 0.45 grams per man per day, to 0.5 grams. Lusk, citing data of Hoffstrom and the work of Blunt and Cowan, indicated that one-third to one-half more calcium and phosphorus is required in pregnancy and lactation than for normal healthy adults. Revisions have been made in Table 42, "Calcium Content of Typical Foods," and in Table 43, "Phosphorus Content of Typical Foods," since the previous edition of *CHEMISTRY OF FOOD AND NUTRITION*. Some food items have been added; others have been dropped; and values for a given item are based on tests for larger numbers of food samples. New information

from experiments by a number of research workers refers to the utilization of calcium in various foods. It has been shown that the calcium of certain green vegetables is well utilized, while the calcium in others is almost useless. Need for further study is indicated.

Chapter XV, entitled: "Iron and Copper in Food and Nutrition," has been rather extensively rewritten. The several additions and changes are summarized at the end of the chapter. The main points of this summary are indicated by the following quotations: "The frequency of occurrence of anemia does *not* imply a corresponding frequency of iron deficiency in food supply. Even such anemias as are curable by iron are not to be assumed to have been due to iron-poor food." The amounts of iron necessary to effect a cure are so much larger than the amount in a normal diet, that an anemia cured by iron may involve something more than a deficiency in the diet. "Recent iron-balance studies show the normal nutritional requirement for iron to be somewhat less than previously estimated." It should be remembered that, "an average requirement of say 12 mg. means 12 mg. *as contained in ordinary foods.*" This is true whether or not only three-fourths of the iron in ordinary foods is "available." Iron requirements of normal women have been over-estimated because of misinterpretation of iron-balance experiments, and also because women whose iron losses should be counted as abnormal, have been included in obtaining averages for normal needs. It is better to recognize the idiopathic cases, says Dr. Sherman, and "see that they get medicinal iron under medical advice than to try to get idiopathically high amounts of iron into dietaries."

Beginning with Chapter XVII, Dr. Sherman has rearranged the order of the book; three chapters have been added, and the subject matter entirely rewritten.

Chapters XVII to XXIV discuss the vitamins. There is a constant flow of new knowledge in this field from research laboratories, and the up-to-date review of results of experimental work given by Dr. Sherman is extremely valuable. The extensive lists of references for the different vitamins will be very useful to students and other persons interested in this subject.

Vitamins in this sixth edition of **CHEMISTRY OF FOOD AND NUTRITION** are designated according to the actual chemical substance and its structural formula, in line with recommendations of many official agencies, such as the American Medical Association, the United States Pharma-

coepia, the American Institute of Nutrition, and the Nutrition Committee of the Health Organization of the League of Nations. The structural formula for each vitamin, where such has been established, is given, and a detailed discussion of the chemical properties and nutritional function of each is included. The findings of various investigators are listed separately. All conclusions and data are brought fully up to 1941. Food tables showing typical sources of each vitamin are given. Normally required amounts of each vitamin as determined by recent investigators are carefully outlined.

Chapter XXI deals with newly identified, water-soluble vitamins. These vitamins have been recognized as separate entities in the B group. In some cases a structural formula has already been determined. Knowledge of nutritional functioning of these vitamins has not yet been established. The water-soluble vitamins mentioned in this chapter are: Vitamins B₃, B₄, B₅ and B₆ (Pyridoxine); and Vitamin H, Vitamin M, Vitamin P (Citrin), Pantothenic Acid, Factor W, the Grass-juice factor, and Choline.

In Chapter XXII, Vitamin A is shown to be really two substances: Vitamin A₁ found in salt-water fish, and Vitamin A₂ found in fresh-water fish. The discovery of A₂ has thrown some of the details of the molecular structure of Vitamin A as accepted to date into debate. In addition, there are the formerly identified substances (four of them) known to be precursors of Vitamin A, which are readily hydrolyzed in the body to yield Vitamin A.

Chapter XXIII is called "The Vitamins D," because by 1940 it was realized that there are probably at least ten such substances, members of the sterol-group, five of which have been fairly well defined chemically. Only two are of outstanding importance: D₂ (activated ergosterol) and D₃ (activated 7-dehydrocholesterol). These two forms are the ones that were identified several years ago and are known on the market as: calciferol and viosterol (forms of D₂), while D₃ has been identified with the principal natural vitamin D of fish oils, and is presumably the same as is found in milk and eggs.

Chapter XXIV takes up "Other Fat-Soluble Vitamins." The nutritional functions of all but one of these factors seem to be fairly well defined, but required amounts and units of measure are still not quite clear. The "other fat-soluble vitamins" discussed are: (1) Vitamin E, now known as "alpha" and "beta" tocopherols, is designated by the term

Vitamin E, because the tocopherols are clearly closely related. Vitamin E is known to be necessary to successful reproduction, and is also tied up with the proper functioning of the nervous system. (2) Vitamin F, about which little is said; and (3) Vitamins K₁ and K₂ which are known to have antihemorrhagic properties.

Chapter XXV, entitled: "The Nutritional Chemistry of Reproduction and Lactation," not only takes up the interrelationship between energy, protein, minerals, and vitamins under the special conditions created by reproduction and lactation, but also states the required amounts of these dietary essentials during periods of reproductive activity.

The wider, more far-reaching effect of the practical application of the newer knowledge of nutrition through successive generations is the subject of Chapters XXVII to XXX. These chapters will be very useful to those who are interested in the social significance of nutrition. Dietary standards in terms of types of foods provide the needed interpretation of food chemistry for its practical application. Optimal levels of food intake are defined for each nutritional factor. Several tables on food allowances and distribution of calories in diets to obtain well-balanced diets are included in Chapter XXVII. Simple food budgets are outlined for urban families, and it is shown that the amount of money required to maintain good nutrition depends largely on a knowledge of food values and willingness to put such knowledge into practice.

Chapter XXX is a discussion of "Nutritional Chemistry and Human Progress" as viewed by persons directing public welfare, health, and research organizations. Data are presented to illustrate that death rates can be decreased and better health attained by all age groups when modern knowledge of nutrition is put into practice.

EMILY K. STAMM

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DIFFERENTIAL FERTILITY IN BUTLER COUNTY, OHIO

A N INTENSIVE study of differential fertility, "Average Number of Children Per Woman in Butler County, Ohio: 1930," has recently appeared in the form of a Census monograph prepared in cooperation with

the Scripps Foundation for Research in Population Problems.¹ For obvious reasons, the data available in the regular publications of the Census Bureau seldom satisfy all the desires of students working on specialized population problems. In this cooperative endeavor with a private organization, the Census Bureau went back to the original enumeration schedules of the 1930 Census for Butler County and transferred to a special tabulation sheet "all the information which it was thought could possibly be useful in studying the relations between the number of children under 5, and the social and demographic conditions of the women." For machine analyses, a special card was punched for every woman 15-49 years of age. Dr. Thompson of the Scripps Foundation assumed responsibility for the analysis of the data and for the accuracy of the calculations.

With respect to organization, an unusual feature of the report is the placing of the summary and conclusions at the front. This plan has much to recommend it, especially in the preparation of monographs. It perhaps attracts a wider reading at least of the main findings among individuals not interested in the technical details.

Although the study is restricted to one county, the findings are of general interest and in some instances they relate to matters heretofore explored but little. Two reasons were cited for choosing Butler County: it was believed to be fairly typical of many counties in Ohio, Indiana, and southern Michigan; and it is the county in which the Scripps Foundation is located.

The selection of a county in that general area also proved to be profitable for a reason not cited above, but doubtless in the minds of the planners from the outset. Located in the southwestern part of Ohio, Butler County, rural and urban, has received substantial numbers of migrants from Kentucky. This situation was utilized to the full in making basic classifications of the data. Throughout the monograph, the following four groups of "first marriage" women 15-49 (or 20-44) were maintained:

Group 1. Northborn residents of urban communities of Butler County.

Group 2. Northborn residents of rural areas of Butler County.

¹ Warren S. Thompson (assisted by Nelle E. Jackson and Richard O. Lang): *Average Number of Children Per Woman in Butler County, Ohio: 1930*. Bureau of the Census, Washington, 1941, 81 pp. (Offset). A Census monograph prepared in cooperation with the Scripps Foundation for Research in Population Problems.

Group 3. Southborn residents of urban communities of Butler County.

Group 4. Southborn residents of rural areas of Butler County.

As expected, the average number of children under 5 was lowest in Group 1, and it increased in the order in which the groups are listed. Results of exceptional interest, however, were those which developed from the addition of birthplace of husband to the above classification to yield different types of marriage combinations. To state the findings briefly, the data appeared to suggest that birthplace of husband bore a more important relation to size of family than did the birthplace of the wife. On this point the report states that this result "came somewhat as a surprise for it has been quite commonly assumed that where voluntary control of the size of the family is widely practiced the attitude of the wife is predominant in determining the number of children." In this connection, however, it should be pointed out that when the data were further broken down by rent, the difference between northborn-southborn marriage combinations tended to disappear in the high rent classes. In the words of the author, "low economic status favored the retention of those social and cultural differences between the northborn and southborn people in this County which make for differences in fertility, while good economic status tended to reduce the fertility of all Groups, classes, and marriage combinations to a common level." Actually, therefore, although the data suggest the importance of patriarchal attitudes regarding family size among groups of low socio-economic status, they do not disprove the belief that the attitude of the wife is predominant within groups in which the "voluntary control of the size of the family" is presumably *most* widely practiced.

The data afforded some evidence that the difference in average numbers of children "seemed to be more closely associated with economic differences, as measured by rentals, than with occupational differences." This point was of interest to the reviewer for a somewhat similar situation was suggested from materials in the National Health Survey, which afforded cross classifications of fertility data by income and occupational status.

Among other relationships traced by the author are those between fertility and such factors as gainful employment of the wife, number of workers in the family, doubling up of families, and value of farm. A large amount of standardization was carried out in order to test the bearing of various factors on differences in fertility.

The chief limitations of the study appear to have been amply described in the report. There was a narrow territorial restriction. In addition, the sample proved to be inadequate at certain crucial points "since many cells in some of the most interesting tables contained too few cases to permit of any judgment of the meaning of the association." It is hoped that more adequate data from the 1940 Census will be utilized for intensive studies of this character.

CLYDE V. KISER

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HEALTH INDICES FOR GREATER LONDON AND NEW YORK, 1931-1940

BECAUSE the total populations of the two cities are almost alike in size, Dr. Percy Stocks in an article, entitled "Health Indices for Greater London and New York, 1931-1940,"¹ presents for comparison their death rates from various causes.

Dr. Stocks used for his New York City material data from the February, 1941, issue of the *Quarterly Bulletin* of the Health Department of New York City. The death rates for the years 1931-1940 have not been corrected for inward and outward transfers as are the rates for London. That is, the New York figures do not include deaths of residents which occurred outside the city, nor do they exclude the deaths of nonresidents which occurred within the City. As Dr. Stocks states, "in the case of tuberculosis, from which cause a large proportion of deaths of town dwellers occur in institutions situated in the country," the rate for New York City would be about 10 per cent higher if corrected for residence.

The best way then to compare the trend in the death rates for these two cities is to study the changes in the ratio of the Greater London death rate to that of New York. "Changes since 1931 in the distribution of hospital cases in and around New York are unlikely to have seriously affected the ratio, and if the ratio has consistently increased, the conclusion must be drawn that progress in reducing mortality from the disease in question in Greater London has not kept pace with that in New York and vice versa."

¹ Stocks, Percy: Health Indices for Greater London and New York, 1931-1940. *British Medical Journal*, July 19, 1941, No. 4202, p. 96.

On examination of the death rates for diphtheria per million children under 15 years of age, the London-New York ratio from 1931-1934 ranged from 2.0 to 6.5, but from 1937 to 1940 it ranged from 6.0 to 8.6. As Dr. Stocks points out, New York had forced death from this cause down by 85 per cent since 1932; on the other hand, London has been able to reduce its rate by little more than half.

For scarlet fever, the death rates rose and fell for both cities until 1936 when a definite downward trend was begun. New York's rate per million children under 15 years of age dropped from 38 in 1936 to 9 in 1940, and that for London dropped from 36 to 7 in the same period. In this instance, New York and London showed a similar decrease of more than 75 per cent.

The death rate for measles in both cities showed extreme fluctuation. The rates, in the long view though, have been falling decidedly in both cities, with London's rate throughout the period remaining approximately five times that of New York. In the case of whooping cough the ratios have changed only slightly; London's rate in 1939-1940 was 2.4 times that of New York.

From 1931-1936 tuberculosis mortality among persons of all ages declined at a greater rate in London than in New York. But due to an accelerated decline in New York in recent years combined with a setback in London, the ratio increased from 1.10 in 1936 to 1.23 in 1939.

Although appendicitis death rates have been consistently higher for New York than for Greater London, a more rapid rate of improvement in New York caused the ratio to rise from 0.45 in 1931 to 0.55 in 1939.

According to Dr. Stocks, suicide death rates were high in both cities during the early years of the depression; and while they have been declining in both cities since 1933, New York had a slight rise in 1938-1939. The ratio of Greater London to New York reflects this disparity in its drop from 0.81 to 0.77 in the same interval.

New York City's infant mortality rates based on live births may be compared directly with those of London, since infant deaths from all causes in New York State are allocated to the place of residence. The average rate for London in the period 1931-1933 was 8 per cent higher than that for New York. In the 1937-1939 period, this excess had risen to 24 per cent. Dr. Stocks feels that war conditions must inevitably further retard improvement in the London rate and increase the widening gap for the time being.

These death rates by causes, presented in comparable form, have served to stress one of the objectives ever present in public health. Dr. Stocks now sees this objective as a need for renewed vigor in bringing down death rates in the postwar era, deplored the tendency to rest on past performance in this field. He salutes New York as a city which has forged ahead here, and looks toward the day when health indices will be as much a subject for intercity rivalry as are other aspects of our daily lives.

FLORENCE WATERMAN

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